METAL FINISHING

REPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

ST, 1944—42nd YR.

ounded as METAL INDUSTRY,
January, 1903 by
PALMER H. LANGDON
1868-1935

METAL FINISHING

VOLUME 42 AUGUST, 1944 NUMBER 8

Publication Office
11 West 42nd St.
New York 18, N. Y.

PUBLISHED MONTHLY—Copyright 1944 by The Metal Industry Publishing Company, Incorporated, 11 West 42nd St., New York 18, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, $2.00 per year; Canada, $2.50 per year (includes 50c exchange and tax). Foreign $5.00. Single copies 25c. Please remit by check or money order; cash should be registered.

ADVERTISING RATES on application. Forms close the 25th of preceding month. Advertising copy should be mailed in time to reach us on or before the 20th of the preceding month.

METAL FINISHING reserves the right to investigate all products offered for advertisement, to refuse advertising considered unsuitable and to edit advertising copy when necessary.

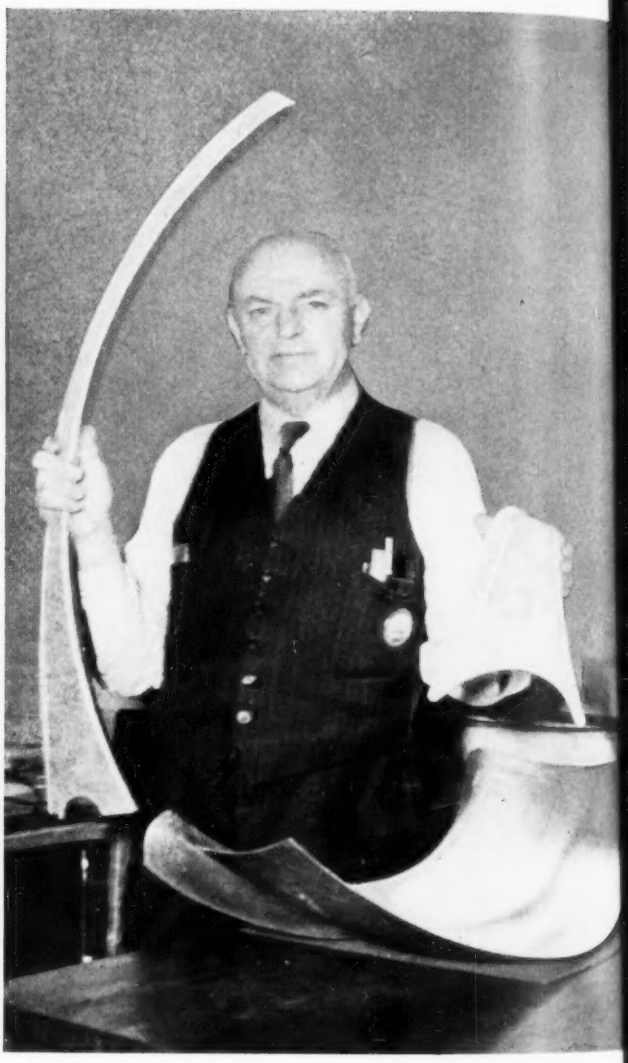
CONTENTS

DEPARTMENTS

Solving the Problem of Burring

ALCAD SHEETS

ONCE MORE LEA TECHNICIANS SERVE INDUSTRY



The American Stove Company, Cleveland, is carrying out important war contracts which include fabrication of plane parts from aluminum clad sheets. Upon assuming this contract, a high tempo of production had to be set and kept, but shifting from slow hand to faster machine burring and polishing of these ALCAD sheets presented some rather tricky problems.

ALCAD has a delicate film which can easily be damaged not only when being burred but in the washing afterwards. The resulting polish has to be such that it would not crack in subsequent forming operations. LEA Technicians were called in to advise on proper machine methods and to supply the proper compositions. How well they succeeded is summarized in this way by the management:

> "From the production standpoint, we have gained considerably. The quality of work has been improved to such an extent that resulting scrap has been greatly reduced. We have been able to increase our production schedule."

LEA serves industry by showing how to get faster, more economical, more precise burring, polishing and buffing.

THE LEA MANUFACTURING COMPANY

WATERBURY 86, CONN.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

VOL. 42, NO. 8 METAL FINISHING AUGUST, 1944
PREPARATION, ELECTROPLATING, COATING

Gelatin in Acid Plating Baths

Gelatin has long been employed as an addition agent in acid plating solutions of tin, lead, zinc, copper and nickel. At the seventy-fifth annual meeting of the British Iron and Steel Institute, recently held in London, a paper was presented by Hothersall, Hopkins and Evans which may have an important influence on future practice of electrodeposition from such solutions containing gelatin and similar materials.

Although the paper was entitled "Soldered Joints" and was essentially a study of the effects of methods of cleaning steel sheet in preparation for electro-tinning on the strength of soldered joints, an unexpected result led to further investigation. It was found that stronger joints were obtained with the sodium stannate bath than with the standard acid tin bath containing gelatin, cresol-sulfonic acid and beta-naphthol as addition agents. It was subsequently determined that dipping the cleaned steel into an alkaline solution before plating in the acid bath had a very beneficial effect.

The supposition that loss of joint strength was due to adsorption of gelatin from the acid plating solution was confirmed by tests made with gelatin solutions of high and low pH and by plating in acid tin solutions with less than the normal amount of gelatin. It appeared that, when a clean steel sheet is given an alkaline dip, sufficient alkali remains in the pores to retard the adsorption of the gelatin by the steel base until deposition of tin has commenced.

Although it generally has been considered good practice to follow the acid dip by an alkaline neutralizer before plating in alkaline solutions, if the adsorptive effect is also noticeable in the case of other acid plating solutions besides tin, containing gelatin, it may also be advisable to use an alkaline neutralizer before plating in such acid baths.

The Coloration of Stainless Steels

By CLEMENTS BATCHELLER

President, The Coloron Corporation, Albany, New York

STAINLESS steel is unquestionably the "Master Metal" of the Steelmakers' art, and while this group of alloys consists of a wide variety of differing types, each best suited to a particular use or service condition, such steels are basically iron, alloyed with proper amounts of chromium to constitute the martensitic, or magnetic group of alloys. Additions to this group of varying amounts of nickel, depending upon type and use, produce alloys of the austenitic, or non-magnetic group.

While, of course, other essential elements are present in the various metallurgical formulas, to produce the full list of "stainless" and "rustless" steels, their claims to such titles are fundamentally due to the inclusion of chromium and nickel in their structure.

When it is recalled that most of the stainless alloys, as cold rolled strip, sheet and bar products are capable of taking on, under steps of wheel, roll and hand polishing methods, surface finishes comparable to fine electroplate, it is with some temerity that one faces the possible accusation of attempting to "gild the lily" in discussing ways and means for their coloration, or in fact any necessity for such disguise.

Test panel of highly polished stainless steel specimens in author's mill laboratory. Pit corrosion is gradually destroying entire alloy surface. Normal photo taken after 18 months.

Before discussing whys and wherefores of coloring such alloys, it is well to examine the headings under which these commercially important alloyed irons are commonly known. Such terms as "rustless" and "stainless" in the light of modern metallurgy, are pure misnomers.

Even the best types of these alloys cannot fully justify such titular claims, as they are neither fully rustless nor stainless, except under fully controlled conditions affecting their surface, environment and specific and proper commercial use.

Stainless steels contain major percentages of iron in their physical make-up, irrespective of type and, therefore, when one studies the behavior of the base metal when subjected to favorable oxidizing conditions, it becomes not too difficult to understand why the element oxygen can either protect or partially destroy such types of iron alloys.

In qualifying the paradox, it has been scientificially established that common steel (deoxidized) which appears to oxidize (rust) very slowly under common observation actually produces under favorable conditions, an easily weighable rust film after two minutes exposure.

Stainless steels, and especially those of the straight chromium types owe their major corrosion resistance to the presence upon their surface of a single, continuous layer of oxygen atoms to maintain its "passive" or non-rusting state. To give some idea of the thickness of such protective film it has been determined with reasonable accuracy, by means of the Gulbransen vacuum balance, that such films weigh approximately three millionths of an ounce per square inch of alloy surface.

The "coloring" of basic ferrous metals embracing the field of common irons and steels has largely, under the impetus of war necessity, become an important and constantly increasing adjunct to the general metal finishing art, with promise of still greater importance in the surface treatment of the metal when research has further opportunity to develop new methods, and discover wider fields for their application.

While the blackening of unalloyed ferrous metals is carried out in highly concentrated alkaline, aqueous solutions, such methods as currently practiced are wholly ineffective for coloring alloys of the metal. Inversely, standard coloring electrolytes which are satisfactory for alloy steels and irons have little or no value for coloring the unalloyed metal. This is due to the fact that such electrolytes must contain relatively high concentrations of sulfuric acid, of about 50% by weight of water used. While this acid serves as the principal oxidizing agent in all stainless steel coloring formulas, certain etch-inhibiting agents must be added to the electrolyte to effectively prevent partial surface dissolution of the alloy being processed. Such inhibitors may be taken from the vanadates, metavanadates or vanadic acid. Chromium salts of sodium and potassium are likewise effective.

Aside from their relative cheapness, there are additional advantages to be gained in the use of chromium salts as effective etching inhibitors. They additionally serve as a means of adding supplemental oxidizing power to the electrolyte, and at the same time furnish substantial and essential amounts of sulfates (bisulfates) when the sodium salt is used.

In the use of sodium dichromate as an etch inhibiting-supplemental oxidizing agent, its normal chemical reaction in the presence of the main acid forming the electrolyte results in the formation of relatively small amounts (in the small proportion used) of chromic anhydride (CrO_3) plus still smaller amounts of dichromic acid ($H_2Cr_2O_7$).

Such additions to the full electrolyte formula not only serve in the capacity indicated, but the presence of definite amounts of such sulfates, in addition to sulfates of iron, chromium and nickel, etc., which gradually form at the expense of alloy processed, prove of definite value in not only accelerating the time of coloring, but also in the formation of maximum depth color films of an order of about 6000 Angstrom units.

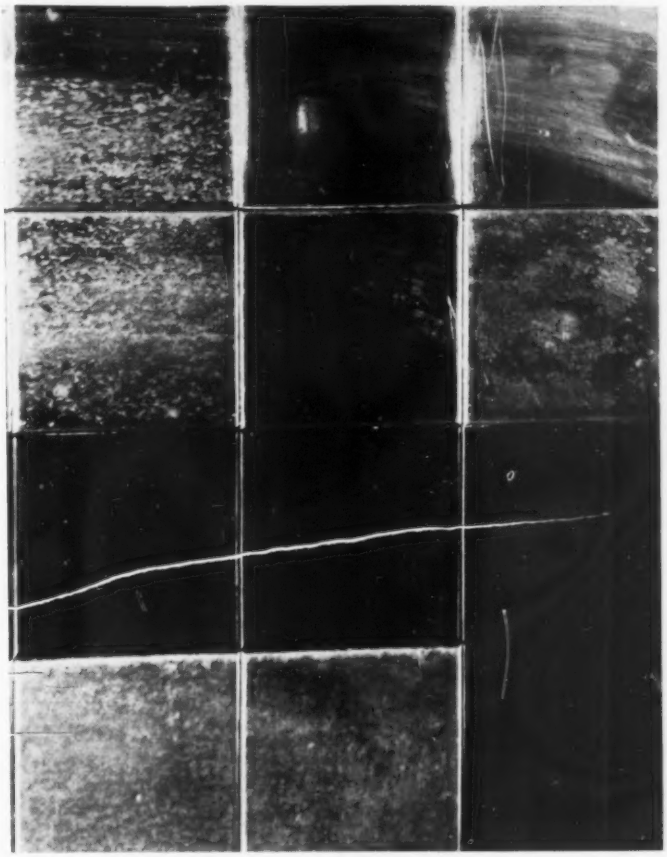
All types of stainless steels, including those of the other groups, which contain the alloying element chromium in about 7% minimum, may be color oxidized in a single tank, as a simple, one-step operation of immersing the alloy in the electrolyte for definite periods of time ranging from about 19 minutes to a maximum of 45 minutes, depending upon the depth of film produced, also its color. Removal of the processed specimen, and water rinsing completes the full step of basic coloration.

It will be noted from the illustration, that a typical coloring unit is very similar to standard electroplating tanks. However, the prime requirement in this instance requires that the tank lining shall be chemical, tellurium or antimony lead inasmuch as we are dealing with an electrochemical process wherein such lining is serving in the capacity of a cathode.

Heating and maintaining the electrolyte solution at proper operating temperature of from 165 to 210 degrees F. is usually by means of a built-in lead goose-neck coil, with gas heat being supplied by an outside burner, equipped with simple thermostatic control. The illustration represents such heating method, although conventional steam coils of chrome-nickel stainless may be used where pressure steam is available. Small liquid volume units are effectively heated by lead sheathed electric immersion units.

The shape and volume capacity of the coloring tank must be "tailored" to the type of products to be processed, also the poundage which must be handled in a given time. Large area sheets, plate, bar and strip products, as well as tightly wound wire coils, may be packed into a suitable rectangular tank, and evenly color oxidized, just so long as such products are slightly separated to permit circulation of the electrolyte, but such products must not be in contact with the lead lining. Small castings, stampings, screw machine products and the like may be bulk processed in a simple lead tumbling barrel, half immersed, and occasionally turned to change the position of the product mass.

There are so many interesting phenomena which take place within the tank of this first commercially developed process for the surface treatment of the simple and complex groups of ferrous alloys, that only the basic high spots permit of discussion within the length of this article.



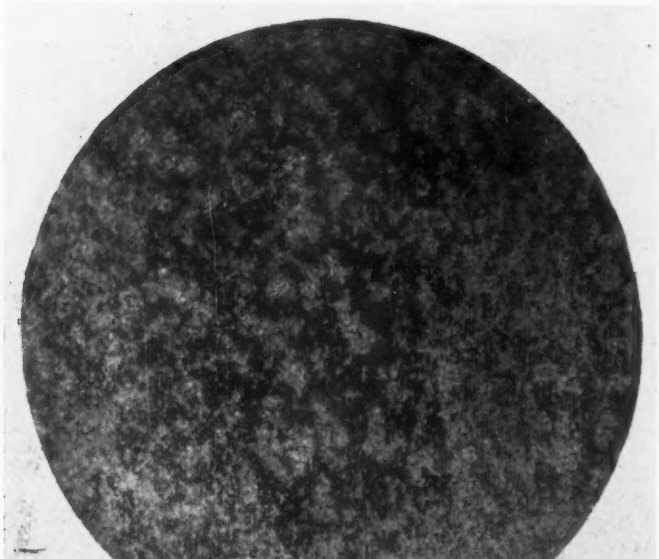
Test panel showing surface condition of highly polished stainless steel specimens after 2½ years exposure in mill research laboratory. Heavy rusting and deep pitting show the complete destruction of original surface. Black specimens represent the same product which have been color oxidized, and show no signs of corrosive attack. Surrounding atmosphere contained at all times, appreciable amounts of sulfuric, nitric, hydrochloric and perchloric acid vapors; also highly corrosive vapors of chlorides of iron, sodium, aluminum and magnesium.

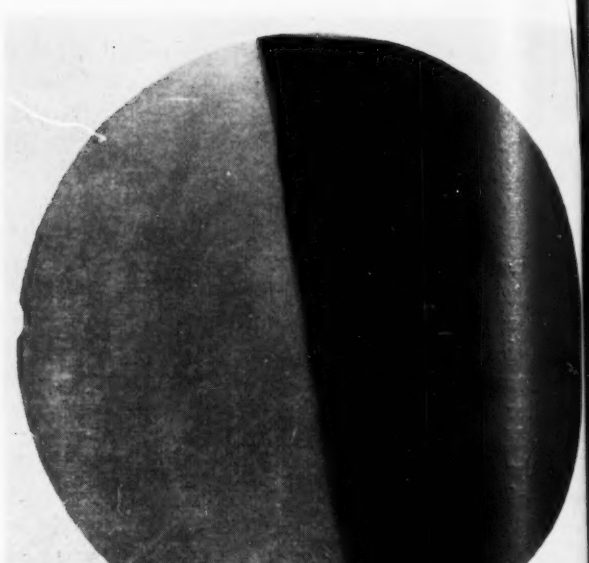
It is considered essential to devote a few words to the basic functioning of a typical coloring solution in its relation to its lead enclosure, before we approach the subject of basic stainless-alloy coloration.

Our typical tank assembly in relation to its coloring solution, functions in the capacity of a voltaic cell. In such tank, the alloy irrespective of type must always color-oxidize as anode, while the tank serves as cathode. All coloring solutions used in the various modifications of the process serve in the capacity of true electrolytes, with the process of continuous color oxidation and film build-up continuing in an orderly manner, just so long as there is a steady current flow through the solution from the specimen to the tank lining.

Accurate electrical measurements have determined this current flow to be in excess of 2 volts-1300 milliamperes at a solution temperature of 170 degrees F. If this current flow from anode to cathode is broken through outside shunting; or if the alloy in process is permitted to remain in contact with the tank lining, the process of color oxidation becomes indefinitely suspended.

In the processing of all types of ferrous alloys under basic steps, such alloys actually lose, rather than gain in weight as the color oxide film is produced. Such loss while easily weighable on the laboratory balance, is very slight, and never sufficient under maximum processing periods to produce appreciable dimensional change in the smallest and





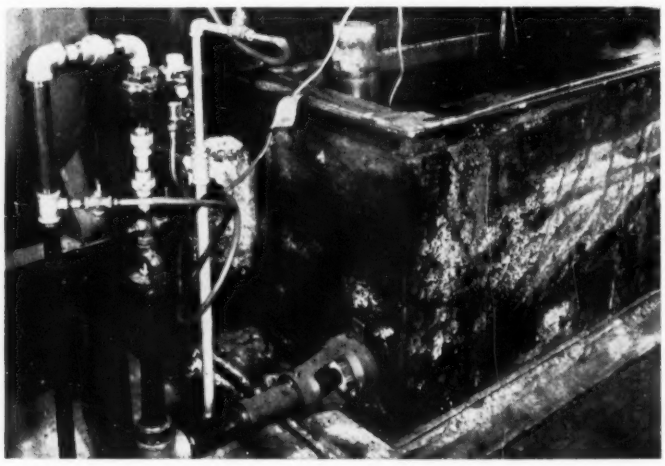
(Above left) Surface condition of plain stainless specimen taken from panel after the rust film had been removed by cyanide cleaning. x10

(Above right) Actual size photo of a color oxidized, 16/18 straight chromium stainless sheet test specimen after 2½ years corrosion test. The light area of the specimen denotes the normal surface of the stainless steel, after the color oxide film has been completely removed by electrolytic stripping. Complete protection against corrosive attack has been afforded to the normal stainless surface.

most intricate part treated. Such very slight processing losses of the alloy metal, caused by some of the surface metal going into solution, is due to the fact that the electrolyte in its function is actually serving as a low voltage-amperage, electropolishing unit.

This seemingly "do-all" electrochemical process, aside from the basic steps of directly coloring stainless alloys and the like may, upon the addition of extraneous direct electric current, be transformed into a highly efficient unit for:

1. *In-and-out dipping of all alloy parts to produce chemically clean surfaces.*
2. *Anodizing of low alloy content steels.*
3. *Electro-graining of ferrous alloy surfaces to produce uniform, fine micro-etching.*
4. *Electropolishing of small, intricate alloy parts, including composite parts of ferrous alloy-monel and ferrous alloy-nickel.*
5. *Precision electro-etching of design from lithographic "resist" printing.*
6. *Rapid, continuous electrolytic removal of hot rolled oxide scale from bars, etc., and surface cleaning of alloy castings.*



A typical gas heated commercial coloring outfit as installed in plant of a leading alloy steel manufacturer.

In the oxide coloration of ferrous base alloys, the alloying metals present in the formula, as well as their percentages have a direct bearing on the number of color films which may be produced. The magnetic alloys of the martensitic group are the most limited in this respect. Austenitic alloy steels containing nickel in addition to chromium, as well as the more complex ferrous alloys, which may contain columbium, manganese, molybdenum, vanadium, tungsten and the like, permit a wider range of coloration.

Steels alloyed with straight chromium in amounts ranging from 7% to about 22% produce films under a definite time cycle, which first appear as light grays, turning to intense blacks, then to deep blue, and on to bronze yellows to the end-color of a deep "chocolate". In all cases of color processing, the end-color represents the heaviest producible film, of a thickness approximating, 0.00010".

The phenomena producing such color change, even after years of systematic research is not completely understood, although it is definitely known that they are not "interference" colors by reason of the fact that they maintain their full tinctorial color values at any angle of observation, and under transparent oil and lacquer films. The chemical structure of all color films produced upon this group of ferrous alloys, is unquestionably a combination of ferric (Fe_2O_3) and ferro-ferric (Fe_3O_4) oxides, plus water of combination. Critical analysis of the stripped films have shown the presence of appreciable amounts of chromium

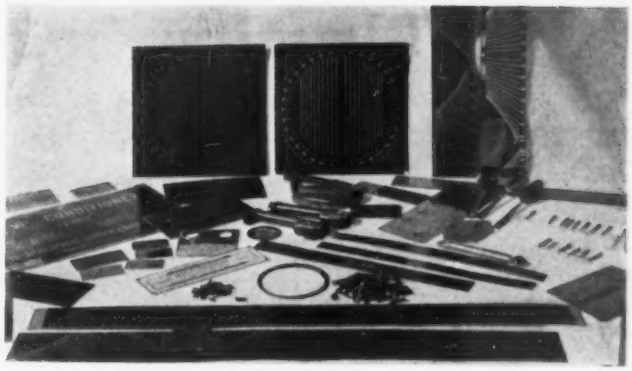
oxide) on these color films.

Ferrous alloys containing nickel in addition to chromium, even relatively small amounts of additional alloying tals produce a still wider range of colors under the basic cessing step. Within the customary time cycle of from to 45 minutes, colors of the martensitic group are reted in the same order, to be followed by maroons, brassds, bronzes with an end-color closely approximating ome green, but off-color, as probably due to the inclusion iron.

Additional colors have been produced upon other types ferrous alloys containing relatively small amounts of nadium, molybdenum, tungsten and the like, to produce id reds, blues and off-shade violet and brown-yellows, inasmuch as such alloys usually constitute the "high ed" tool steel grades, their commercial value is at present ch less than for the typical color oxide films produced on alloys of the stainless-rustless group.

As a whole, the general physical characteristics of these lor films may be considered to be excellent. Being fully egral with the specimen surface, they cannot chip, peel craze, and their ductility is so high that it is necessary to eak the specimen, before the film.

The degree of continuity (impermeability) of all color ide films produced under the basic process are dependent ore or less upon the type of mill finish applied to the steel efore processing. Color oxide films which have been pplied to stainless having a high planish, cold rolled surce, as in the case of strip, or sheets which have been highly olished by the usual mechanical means, are fully continuous unbroken) and in such state, serve indefinitely as effective arriers against corrosion of the basis alloy, and especially all situations where such corrosion of the basis alloy is aused by atmospheric attack. Such conclusions are based pon exhaustive atmospheric corrosion tests covering a eriod of more than 2½ years, under conditions which completely destroyed the normal surface of the non-color xidized test specimens. The degree of corrosive attack upon such normal test specimens is clearly indicated by the accompanying photomicrograph.



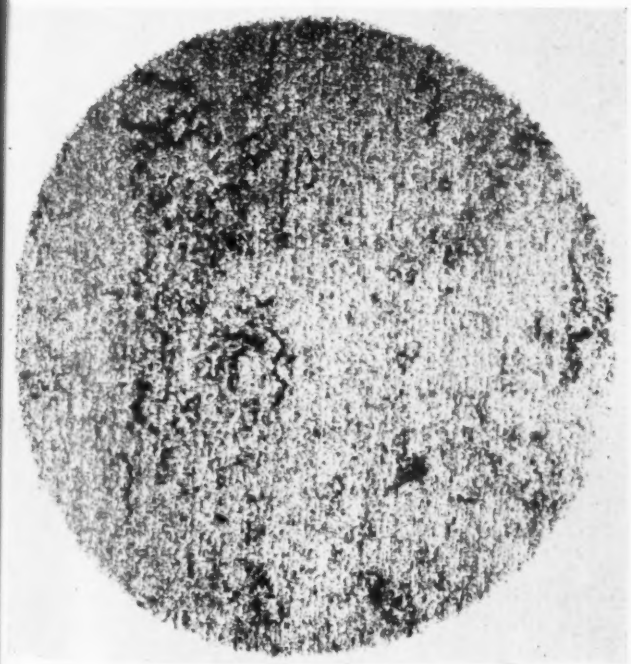
Samples indicating typical applications of the process.

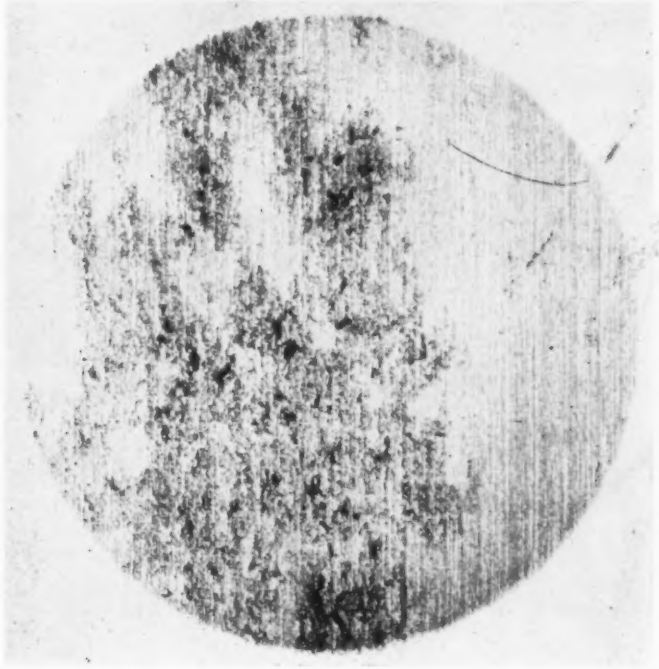
Alloy steel surfaces which have been roughened by the various attrition means, such as acid pickling, grit-blasting or electrolytic etching, quite naturally do not show as high a degree of color film continuity as in the first instance, but in all cases, such films offer adequate corrosion protection, without the use of oil films or lacquer finishes.

The surface finish of all color films so produced characteristically follows the surface finish of the alloy before color processing. "Mirror finish" hand or machine polished stainless steel sheets, under color film processing, produce in the residual film, a super-brilliancy and smoothness of surface which is fully comparable to the best electroplate. Matte, color surfaces are produced upon mill pickled sheet or strip as supplied by the maker, although non-reflective matte surfaces may be applied to the alloy prior to its coloration to produce under process modification a uniform, micro-etched or grained effect upon any type of cold rolled finish customarily applied to the product.

The color oxide films so produced are not sufficiently resistive to strong abrasive attack to permit their use for

(*Concluded on page 474*)





Surface condition of specimens taken from panel after complete removal of corrosive film. Vertical lines are the result of belt polishing of the stainless surface, and likewise show the results of deep corrosive attack. x100.

Plastics in the Plating Industry

By HAROLD NARCUS

Chief Chemist, Plating Processes Corporation, Holyoke, Massachusetts

CONCLUSION

Synthetic Rubber

BEFORE the beginning of the present conflict, which resulted in an acute shortage of natural rubber, the rubber industry was constantly making new developments which were utilized by the plating industry. However, since Pearl Harbor and perhaps even 10-15 years prior to that eventful day, synthetic rubbers, mostly all related to natural rubber, but different from it in many respects which make them superior, have come upon the market. These newer materials are increasing the field of usefulness of rubber-lined products, such as plating tanks and racks, in many ways. Generally they are more corrosion-resistant and oil-resistant than natural rubber which itself is an ideal material for use in the plating room.

It is well known to the industry that rubber, when properly compounded, is suitable for practically all types of electroplating with the exception of chromium plating and can be used with almost every type of inorganic acid with the exception of those having strong oxidizing characteristics such as nitric, chromic, and high concentrations of sulphuric acid. In addition it is not attacked by alkalies and inorganic salts used in the make-up of the plating solutions. It is also unharmed by many acids of an organic nature.

If a suitable rubber has been selected for a particular job and the equipment designed for that job by a competent manufacturer, there are many advantages derived from using this type of material. In the case of a plating tank lined with rubber, there is less contamination of the electrolyte, less current used up needlessly, lower maintenance costs and better temperature control of the plating bath due to lower heat losses and finally, less corrosion of the steel tank results.

Rubber also finds its place frequently in plating accessory equipment such as acid dip tanks, filter-presses, plating racks and barrels to mention only a few examples of its application.

The writer would like to state at this point that no single rubber compound combines all the best qualities of the material. An exceptionally resistant rubber may be very brittle while a tough and elastic rubber may lose some of its desired resistance to certain chemicals.

The selection of the proper rubber compound for use in the plating room cannot be overemphasized, especially in the case where a tank is to be lined with rubber for plating bright deposits as in the case of nickel, zinc, and copper, etc. A certain accelerator or anti-oxidant present in the compound can harm the deposit greatly. Rubber coatings containing alpha naphthylamine (for example) will cause serious contamination of an acid copper solution. Laboratory tests should be made in order to check the effect of the rubber on the deposit from the solution to be used in production.

Generally it can be stated that the best rubber compound to use in the plating room is one which does not contain contaminating anti-oxidants and accelerators harmful to the particular solution, as shown by rigid tests, and, which has resistance to chemical attack, possesses the requisite physical properties and shows the smallest degree of absorption. The synthetic rubbers have not been thoroughly tested for use in the plating room but they warrant close investigation.

In beginning the discussion of the more familiar synthetic rubbers the one mostly used in stop-offs for the plating industry is chlorinated rubber. It has excellent resistance to both strong and weak acids and alkalies. "Tornesite" and "Parlon" are familiar trade names given to chlorinated rubber. This material improves the paint film because it makes it extraordinarily immune to almost all chemical solutions which are liable to attack this film. It promotes rapid drying and insures impermeability of the coating

Courtesy of B. F. Goodrich Co.

Service: Cleaning stainless steel rods and tubes in a solution of 15-30% nitric acid. Synthetic lining with acid brick sheathing for thermal and physical protection. Size 40'0" long x 4'0" wide x 2'4" deep.

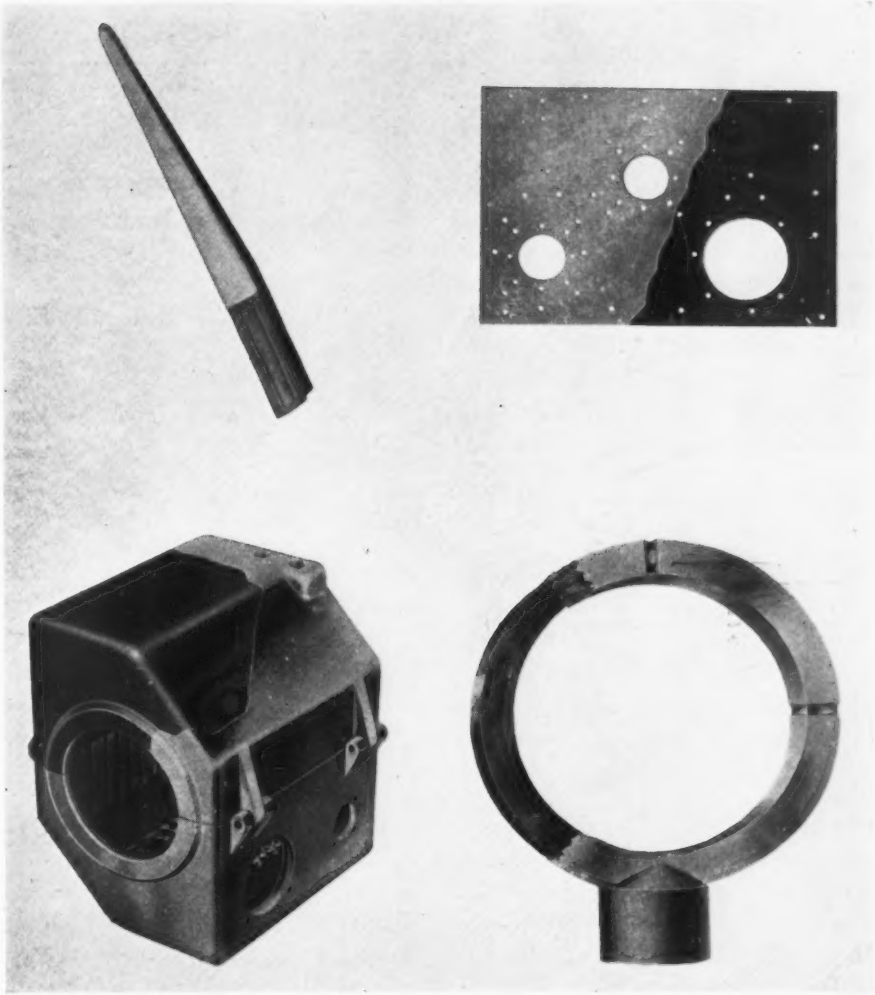
to water. Chlorinated rubber itself is odorless, non-toxic, and non-flammable. It is compatable with many resin enamels. It must be remarked, however, that the resulting film containing chlorinated rubber cannot be exposed to high temperatures for too long a time. The requirements of the Armed Forces have curtailed the use of this material in the plating industry tremendously.

"Neoprene," which is a chlorobutadiene polymer (C_4H_5Cl), has been in use in the United States since 1932 and it has been utilized increasingly by industry since that time. A number of various types of Neoprene are produced from this material, depending on the ultimate use of the synthetic rubber. The crude material is compounded with other ingredients and then processed on rubber-making machinery and finally vulcanized. Neoprene has high tensile strength, resilience, elasticity and abrasion resistance. It withstands deterioration when exposed to oils, chemicals, heat and natural aging. However, the material should not be subjected to elevated temperatures for too long a time. Neoprene has found excellent use in protective coatings for metal surfaces.

A plasticized polyvinyl chloride is an excellent flex-resisting material, better than rubber itself. It is used for tubing for conducting solutions used in the electrolytic refining of metals. It is also frequently used for lining tanks which handle highly corrosive mixtures of nitric and hydrofluoric acids, used in pickling stainless steel.

"Thiokol A," and "F A," organic polyfulfide products, first were made available around 1929 and are used in making lacquer hose. Coatings can be made from these materials which are highly resistant to solvents, possess low water absorption rates and are corrosion resistant. Flexible coatings on metal are available using the Thiokols. The product has excellent resistance to deterioration, good resistance to aromatic hydrocarbons, but has lower physical properties than natural rubber or the other synthetic rubbers, specifically resilience and tensile strength. It has only fair resistance to abrasion and extreme temperatures.

"Buna S" came into prominence in 1940. It is the copolymer of butadiene (C_4H_6) and styrene $C_2H_3(C_6H_5)$ and is the synthetic rubber most similar to



Courtesy Metaplast Company

Examples of plastics metallized for war purposes. Upper left—antenna mast. Upper right—instrument panel. Lower left—swivel joint housing. Lower right—antenna loop.

natural rubber in processing and performance characteristics. It can be vulcanized with sulphur and rubber accelerators and "cured." It is usually compounded with carbon black. Buna S is a tough material and resists heat. Unfortunately it swells in oils and some solvents.

"Chemigum" (Buna N) is a copolymer of butadiene and acrylonitrile or vinyl cyanide (C_2H_3CN). It has good oil-resistance but resistance to light is poor. It can be vulcanized with sulphur and rubber accelerators and cured to hard rubber. Buna N has much lower solubility in the conventional rubber solvents. It is a tough material and has a distinctive odor.

"Butyl Rubber" is a copolymer of isobutylene (C_4H_8) and butadiene (C_4H_6) or isoprene (C_5H_8). It is comparable to natural rubber but has less adhesion and a longer curing time. It cannot be vulcanized to hard rubber but has good resistance to deterioration, oxygen and acids. Generally its physical properties are lower than those of natural rubber. It is highly impervious to gases. Butyl Rubber is best used where resistance to chemicals and oxidation is most important. Its electrical properties are excellent. This type of synthetic rubber has resistance to strong sulphuric and nitric acid and salts of copper and other heavy metals have no effect on the aging of this rubber. Its water absorption is much less than that of natural rubber.

With permission of the U. S. Rubber Co. the table on the following page is reproduced, clearly showing the comparative properties of the various well-known commercial types of synthetic rubbers.

Summarizing, the commercial synthetic rubbers differ from natural rubber in their individual characteristics. In a recent publication the comparison of the two was presented, as follows:

1. Synthetic rubbers are different from natural rubber in pro-

TABLE OF COMPARATIVE PROPERTIES

Properties Important in Processing:	*Natural Rubber*	*Buna S Type*	*Buna N Types*	*Neoprene Types*	*Butyl Type*	*Polysulfide Thiokol Types*
Form in which available:	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Solid Form	Dispersion, Solid & Powder Forms
Breakdown	Very Good	Good	Fair	Good–V. G.	None	Slow
Plasticity Range after Breakdown	High-Low	High-Low	High-Medium	High-Low	Medium	High-Low
Building Tack and Cohesion	Excellent	Fair	Fair	Very Good	Good	Fair-Good
Vulcanizability	Very Good	Very Good	Very Good	Very Good	Fair-Good	Fair
General Processability	Very Good	Good	Fair	Good	Fair	Fair
Properties Important in Application:						
Physical Properties						
Extensibility	Excellent	Good	Good	Excellent	Excellent	Good
Resilience	Excellent	Good	Fair-Good	Very Good	Low	Good
Tensile	Excellent	Fair-Good	Good	Very Good	Good	Fair
Electrical Properties	Excellent	Excellent	Fair	Fair	Excellent	Fair
Impermeability to Gases	Good	Good	Good	Very Good	Excellent	Excellent
Impermeability to Water	Good-Very Good	Fair-Good	Fair-Good	Fair-Good	Very Good	Very Good
Resistance to:						
Plastic Flow	Very Good	Good	Good	Good	Fair-Good	Low
Abrasion	Very Good	Good-Very Good	Good-Very Good	Very Good	Fair	Low
Tear	Very Good	Fair-Good	Fair-Good	Good	Fair–V. G.	Fair-Good
Heat	Good	Fair-Very Good	Fair-Very Good	Very Good	Fair	Low
Cold	Very Good	Very Good	Fair-Good	Fair–V. G.	Good	Fair-Good
Chemical Properties						
Resistance to:						
Air	Fair	Good	Good	Excellent	Excellent	Excellent
Ozone	Inadequate	Inadequate	Fair	Excellent	Excellent	Excellent
Light	Fair	Fair	Low	Excellent	Excellent	Excellent
Petroleum	Low	Low	Excellent	Good	Low	Excellent
Aromatic Oils	Inadequate	Inadequate	Fair	Low	Inadequate	Excellent

cessing characteristics and in some cases are more difficult to process.

2. Natural rubber is superior to synthetic rubber in most performance characteristics.
3. Synthetic rubbers are superior to natural rubber in resistance to most influences that cause deterioration.

Natural Resins

The next type of organic plastics to be discussed consists of the natural resins used extensively in plastic compositions and well-known to the electroplater. The most important members of this general group of materials are shellac, rosin, and asphalts.

Shellac and rosin are very familiar to the plating industry. The former which is of great industrial importance as a spirit varnish finish is also an important constituent of several proprietary organic molding compounds. It is known to be one of the earliest plastics, if not the earliest, used. It is most probable that some molding of shellac preceded the introduction of rubber and although its industrial growth, in a smaller way, parallels that of the rubber industry, not having the elastic properties of rubber, its field has naturally been smaller from the outset.

Shellac, alone, as a molding material is not used because the resin has little practical application for molded parts. However, when compounded with other materials, many properties lacking in the pure resin become evident. Powdered shellac is usually mixed with diluents or fillers such as talc-clay, wood flock, common rosin and wax. Coloring pigments may be added and, if electrical insulation is desired, mica is used as an additional filler.

Shellac compounds are cheap and the electrical insulating properties are very good. They should not be used in hot solutions since the softening point of the material is relatively low.

Courtesy Metaplast Company

Navy officers cap insignia electroplated to Navy specifications. Shown on left is the plain plastic base and on the right as finished.

Possibly the most outstanding properties of shellac are its low dielectric constant and excellent adhesive or bonding qualities for use with fillers, as previously mentioned, to produce products of particularly excellent electrical properties. Shellac plastics also possess the advantage of exhibiting a remarkable resistance to carbonization when used for electric insulation.

Shellac plastics are being used to a great extent in the plating room for wire insulation and protective coatings and solutions of shellac are employed in rapid drying varnishes.

Rosin is a natural resin of vegetable origin (different from shellac which is of animal origin). Copal, amber, dammar gum are also members of this same group. Rosin is found in the still residue after the distillation of turpentine from pine resin extracts. It is used in many organic molding compositions. Esterification of rosin with glycerol is known as ester gum which is used in the varnish industry. Platers are very familiar with rosin soaps in cleaners.

The asphalts comprise still another group of these natural resins. They consist of naturally occurring hydrocarbon complexes known as bitumens which are insoluble in water. These bitumens, however, are soluble in carbon bisulfide or benzene. They are black in color, hard at ordinary temperatures, slightly plastic at 150° F. and melt at 212° F. Tars and pitches belong in this group as they can be obtained by the distillation of asphaltic petroleum.

Bituminous linings have proved to be very satisfactory as linings for wooden plating tanks. Either asphalt, tar, or petroleum products may be used provided the material has a high enough melting point. It should not soften or flow at temperatures around 70° C., should have a high melting point, 200° C., and it should be hard but not brittle at room temperature. Bitumen dissolved in benzene serves as an excellent primer to precede the application of heavy coatings.

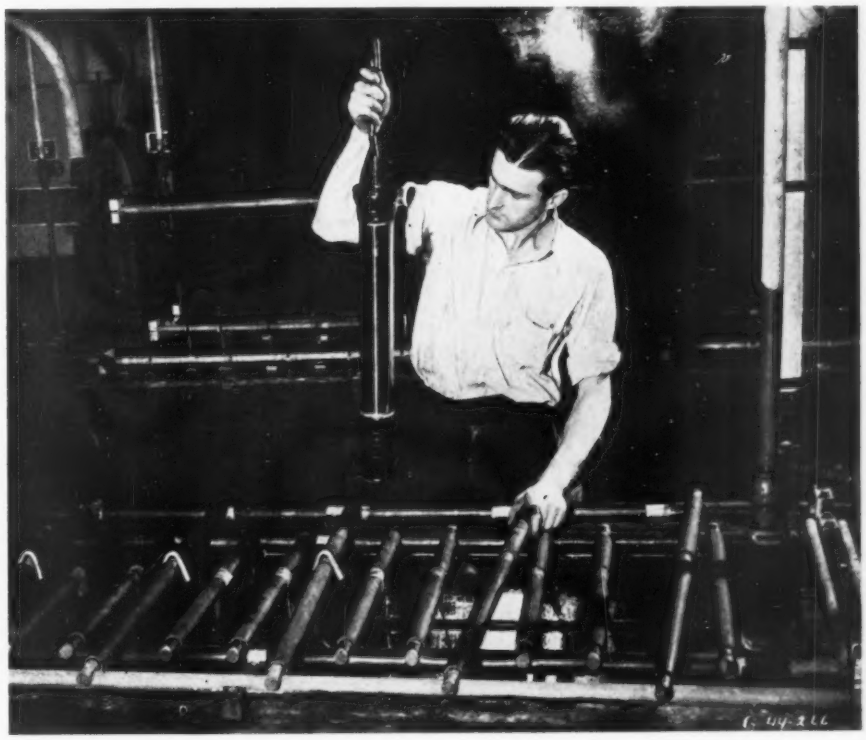
Generally these resins are cheap and have good dielectric strength, hence their use in the electrical industry. An excellent composition is made by melting bitumen and mixing it with asbestos and silica dust.

Protein Resins

The third and final group of the organic plastics comprises the protein derivatives, the one most utilized being casein, obtained from skim milk. It is one of the oldest plastics in industry. Protein plastic compositions are hygroscopic (5-7% by weight in 24 hours) and are affected by atmospheric moisture changes and at the present time a use for them in the plating room is not available although casein, itself, has been utilized as an addition agent in acid copper baths. Casein enjoys great popularity in the fancy-goods trade where its cheapness and the beauty of its finished texture make it very attractive. Casein plastics have good resistance to weak and strong acids, mineral, animal, and vegetable oils, and fairly good resistance to weak and strong alkalies.

Plating on Plastics

In addition to the proper selection of stop-off materials for racks and parts, and for tank linings, possibly the best example of a situation wherein the modern electroplater must have a fair knowledge of the field of plastics is the problem of electrodeposition on these organic base materials. This type of electroplating which imparts



Courtesy of B. F. Goodrich Co.

Synthetic-lined tank for protection against stray currents. Part masked with plastic tape.

metallic properties through deposition of a coating of metal to the plastic is increasing tremendously in popularity.

There are innumerable methods described in both the trade journals and patent literature on this type of electrodeposition but generally they accomplish the same results, some better than others, using the same basic procedure — namely, the application to the plastic surface, after proper treatment, of a conductive and adherent bond coat, usually using an ammoniacal silver solution and a suitable organic reducing agent, followed by an intermediate layer of copper and finally a top layer of the desired metal such as chromium, iron, nickel, gold, silver, cadmium, zinc, etc.

At the present time, the two main purposes for metallizing plastics are first, to render the plastic a suitable substitute for critical and strategic metals and secondly, to produce any article which has the inherent properties of plastics with the desired properties of these metals.

The deposition of metallic coatings on plastics also allows the manufacturer to use certain plastic materials in a particular product which ordinarily he could not utilize. Mixed scrap plastics of one certain type but containing a plurality of colors can be molded and then plated, thus making use of idle scrap.

Furthermore, the undesirable properties of the plastic such as its absorption of oils, solvents, and moisture is eliminated by the metallic deposit. Swelling or distortion of the base organic material is thus prevented. Plating increases the heat and impact resistance, dimensional stability of the plastics, and hence, the rigidity of the original plastic part is increased.

In order that the plater may successfully deposit any metal on a plastic base material he must be given the "case-history" of the material so that he may prepare the surface properly for metallizing and obtain the most adherent metallic coating possible. All plastic materials, for instance, do not receive the same preparatory treatment. Some methods of preparation may work efficiently on one type of plastic while on another they may be harmful to the resin causing attack, excessive swelling, or even disintegration. In other words the actual process of plating differs with the kind of plastic used. The differences mainly lie in the preparatory operations such as roughening and cleaning and the reducing agent used. For example, catalin, urea resins, celluloid, polystyrene, methyl methacrylate must be given a wet-tumbling usually using pumice and water or given a light depolishing while cellulose acetate must go through an additional special priming operation. Bakelite usually needs no roughening but it is advisable. Rubber is first treated with benzol or acetone and casein with 3/4% hydroquinone. The reducing agents used also depend on the original plastic material. Phenol-formaldehyde plastics can be treated with hydroquinone, pyrocatechin and acetone for a few minutes. After thorough drying they are placed in a silver nitrate solution, heated to 80° C. Acrylic plastics employ cane sugar, nitric acid, alcohol and water as reducing agents. The reducing agents for casein are hydroquinone and para-amino phenol. Urea- or thiourea-formaldehyde utilizes boiling hydroquinone while the cellulose acetates are reduced with formaldehyde.

Sometimes, however, by knowing the type of plastic used, short-cut methods for bonding can be used. For example, bakelite can be bonded by mere immersion of the resin for half an hour in a mixture of Ag_2O, NH_3, and water.

This specialized field of plating on plastics is beginning to occupy the minds of progressive manufacturers who are already making their "post-war" plans. This type of electrodeposition has found innumerable uses in the present war-program and will continue to find many applications in the manufacture of civilian goods after the war.

Conclusion

It is hoped that the foregoing discussion will assist the plater in selecting the proper resins in carrying out his particular type of work and will enable him to choose some of the newer, less-known plastics to perform these operations more rapidly, efficiently and economically. The writer is of the opinion, shared by many others, that the plastic and electroplating fields are becoming more and more related to each other as time progresses. There is no doubt that intelligent investigation of the properties of the various plastics might suggest new outlets for these most versatile materials. At least some knowledge of the plastic field is not only convenient but advantageous to the plating supervisor.

THE COLORATION OF STAINLESS STEELS

(*Concluded from page 469*)

any and all applications common to the alloy steel. Where the product must be used under severe abrasive conditions, a supplemental heating step (2 to 3 minutes) will produce effective dehydration of the color film at temperatures between 800 and 1700 degrees F. to increase such resistance some five fold. The only visible change in the film, even if heated to the maximum temperature indicated, is a slight loss of original color.

No color film failures have been reported upon any of the many fabricated products utilizing the features of the art, where such product has been used under conditions proper to film applications. The cost of electrochemical coloring of ferrous alloys is relatively low, in labor, materials and operating costs. Electrolyte solutions have an initial cost of about 5¢ per gallon, and remain active and in full function for a minimum period of about two years, irrespective of the amount of alloy processed.

Evaporation and drag-out losses of the electrolyte may be replaced by only water additions, and the occasional addition of sulfuric acid (about 1 quart per 100 gallons monthly). No appreciable amounts of sludge form within the tank, even under heavy continuous processing operations, and the more constantly the electrolyte is used, the better it functions in every factor.

Average costs of processing, based upon licensee figures, are approximately 1/4¢ per sq. ft. for the basic coloring of sheet, strip and bar products, and a maximum of about 3/4¢ per pound for small castings, stampings, screw machine parts and the like, where such products are bulk processed in barrels or wire baskets. When once the process is set-up and its controlling factors are understood and followed, unskilled labor can do the rest.

Note: Issued and pending domestic and foreign process and product patents, covering all phases of this development are the exclusive property of The Coloron Corp.

Annotated Bibliography of Aluminum Cleaning*

Prepared by JAY C. HARRIS[1] and ROBERT B. MEARS[2]

This bibliography was undertaken to provide Section G on Metal Cleaners of Subcommittee II on Specifications of the A.S.T.M. Committee D-12 on Soaps and Other Detergents with information regarding existent specifications and methods for cleaning aluminum.

References 1-127 appeared in the June, July and August 1943 issues of METAL FINISHING. It was decided to continue the bibliography, and the following material brings the subject up to date, including abstracts of Federal Specifications relating to metal cleaning, which are reference numbers 192-209 inclusive.

(128) Clete L. Boyle, "Cleaning Agent for Metals That Are to be Painted," Canadian Patent No. 356,078; *Chemical Abstracts*, Vol. 30, 2669 (1936).

Mixture of an acid, such as phosphoric, in oil solvent, such as monobutyl ether or ethylene glycol. A compatible wetting agent such as the soluble salt of an alkylated naphthalene sulfonic acid may be used in acid solution.

(129) Charles B. Durgin (to Swann Research, Inc.), U. S. Patent No. 2,037,566 (1936).

A cleaner for tin, zinc, and aluminum comprising the following:

Material	Parts
Trisodium phosphate	63
Sodium perborate	10
Sodium silicate (ratio of Na_2O:SiO_2 of 1:2 or 1:1.32)	25
Magnesium sulfate	2

(130) W. W. Davidson, "Solvent Degreasing," *Transactions*, Electrochemical Soc., Vol. 72, pp. 413-427 (1937).

The solvent degreasing process for the removal of oil and grease from articles prior to being electroplated or otherwise "finished" is described in some detail. Fundamental principles of equipment design and the characteristics of the stabilized, noninflammable solvents are discussed.

(131) Carroll L. Griffith and Lloyd A. Hall (to The Griffith Laboratories, Inc.), "Inhibited Detergent Composition," U. S. Patent No. 2,155,045 application, July 20, 1938.

A corrosion-inhibiting alkaline composition for cleaning zinc, iron, and tin ware in an aqueous solution thereof at from cold to boiling temperatures consisting by weight essentially of about 85 per cent of water-soluble inorganic alkaline detergent, about 5 to 7.2 per cent of a solid hypochlorite salt of a metal from the group consisting of alkali metals and alkali earth metals, and about 9 to 10 per cent of zinc compound from the group consisting of water-soluble zinc salts, zinc oxide, zinc hydroxide, and zinc carbonate.

(132) Carroll L. Griffith and Lloyd A. Hall (to The Griffith Laboratories, Inc.), "Inhibited Detergent Composition," U. S. Patent No. 2,155,046 application, February 28, 1938.

A corrosion-inhibiting alkaline composition for cleaning zinc, iron, and tin ware in a solution thereof at from cold to boiling temperatures consisting essentially of about 85 per cent of water-soluble inorganic alkaline detergent, about 5 to 6 per cent of a solid hypochlorite salt of a metal from the group consisting of alkali metals and alkali earth metals, and about 9 to 10 per cent of water-soluble zinc salt.

(133) Robert H. Brown and Robert B. Mears (to Aluminum Company of America), "Composition for Cleaning Aluminum," U. S. Patent No. 2,316,219 application, April 22, 1939.

A dry water-soluble aluminum-surface cleanser for use in aqueous solution, said cleanser being characterized by an acidic cleansing reaction in said solution and consisting substantially of an alkali metal fluoride and metaphosphoric acid, the latter being the major component and the principal active cleansing agent.

(134) Robert H. Brown and Robert B. Mears (to Aluminum Company of America), "Composition for Cleaning Aluminum," U. S. Patent No. 2,316,220 application, April 22, 1939.

This comprises a mixture of alkali metal fluoride and ammonium dihydrogen phosphate.

(135) W. L. Davies, "Dairy Detergents," *Dairy Industry*, Vol. 4, No. 1, pp. 3-6 (1939).

The analyses of 11 dairy detergents are given. Four of these contain colloidal materials, all contain NaOH and Na_2CO_3 and many contain Na_2SO_3 or Na_3PO_4 or both. Soda ash is the constituent contained in greatest percentage in most of the detergents. Analytical procedures are given for determining these various alkaline materials in the presence of the others.

(136) The Griffith Laboratories, Ltd., "Metal-Cleaning Detergent," Canadian Patent No. 388,542; *Soap*, Vol. 16, p. 65 (1940).

An alkaline composition for inhibiting corrosion and cleaning zinc, iron, and tin ware at temperatures varying from cold to boiling consists of about 85 per cent water-soluble inorganic alkaline detergent such as soda ash and trisodium phosphate, 5 to 6 per cent of a solid hypochlorite, and 9 to 10 per cent of a water-soluble zinc salt.

(137) E. E. Halls, "Efficient Trichloroethylene Degreasing," *Metal Treatment*, Vol. 6, pp. 131-133 (1940); *Chemical Abstracts*, Vol. 35, 6903 (1941).

Attention is given to the following points for efficient operation: low running costs, good cleaning, and high production rates, solvent degreasing can be the cleanest, most rapid, efficient, and safest of cleaning operations. Choose the best stabilized solvent. In design of plant consider mode of heating, recovery of solvent, escape of vapor, and adequacy of cooling. Select vapor or liquor according to the class of work. Operate fully loaded so that inevitable solvent losses occur with maximum work. Study the mode of packing the work. Have men work in fresh rather than solvent-laden air.

(138) E. W. Myers, "Trichloroethylene Degreasing," *American Mutual Magazine*, Vol. 19, pp. 2-8 (1940); *Review of Current Literature Relating to Paint, Colour, Varnish & Allied Industries*, Vol. 14, p. 166 (1941); *Chemical Abstracts*, Vol. 35, 6349 (1941).

A discussion of principles involved in the proper design of equipment for using and controlling the toxic trichloroethylene vapors.

(139) A. M. Berkenheim and M. A. Berkenheim, "The Application of Emulsion from Shale Products for Cleaning Aluminum," *Aviapromyshlemost*, Vol. 4, No. 3, pp. 122-123 (1941); *Chemical Abstracts*, Vol. 37, 4675 (1943).

Concentrated emulsions of "avtol" and of machine oil were prepared using the sodium salts of shale sulfonic acids and this used to replace kerosene in the mechanical treatment of aluminum. The emulsions contain potassium dichromate as a corrosion inhibitor.

(140) Edward Finnie, "Cleaning Lead Castings Prior to Plating," *Products Finishing*, Vol. 5, No. 11, pp. 60-61 (1941).

Because of the present shortage of zinc for domestic use, the zinc-base die castings are being replaced by 12 to 14 percent antimony-lead castings; this forces platers to change their cleaning cycle to meet the change in casting metal composition. Each of the following five cycles gives satisfactory results: (*1*) Degrease, clean cathodically in a mild cleaner at 70 C. (changing the cleaner often), rinse, soak for 5 min. in a 10 per cent NaCN

---

*Reprinted from *ASTM Bulletin*, May 1944 by permission of *American Soc. for Testing Materials*.

[1] Chairman Section G on Metal Cleaners, Subcommittee II on Specifications, Committee D-12 on Soaps and Other Detergents; Monsanto Chemical Co., Dayton, Ohio.

[2] Metallurgical Division, Aluminum Research Laboratories, Aluminum Company of America, New Kensington, Pa.

solution at room temperature, transfer directly to a high-speed copper bath for 5 min. at 35 amp. per sq. ft., rinse, acid dip, and nickel-plate. (2) Degrease, clean cathodically in a mild cleaner for 1 min., rinse, dip in 5 per cent by volume AcOH, rinse, copper-strike in a Rochelle salt copper bath at 2 v. or less for 10 min., rinse, acid dip, and copper- or nickel-plate. (3) Wash in washing machine, clean anodically in a mild cleaner for 5 to 20 sec., rinse, dip in 3 per cent H_2SO_4 for 2 sec., rinse, copper-strike in a Rochelle salt bath at 10 amp. per sq. ft. for 5 min., rinse, and copper- or nickel-plate. (4) Degrease, clean in a mild cleaner cathodically, rinse, reverse current in a 55 deg. Be., bath in H_2SO_4 for 15 to 30 sec., rinse, and copper-strike for 15 to 30 sec. at 5 v. (5) Clean cathodically, rinse, soak in hot water for 5 min., and transfer directly to nickel solution.

(141) Ernest H. Lyons, Jr., "Contamination and Electrolytic Cleaning of Cold Rolled Steel." *Transactions*, Electrochemical Soc., Vol. 80, pp. 367-386 (1941).

Electrolytic cleaning of oil and dirt from lengths of cold-rolled strip steel is of considerable commercial importance, not only before hot tinning but also preliminary to electroplating the strip. The author discusses solutions, details of design, and operating requirements. From a consideration of the cold rolling operation, it is suggested that thermal decomposition of the coolant oils on the strip is responsible for the very resistant films sometimes noted; adsorption of fatty acids may also be troublesome. These contentions are supported by experimental evidence, by citing experiences in the rolling and electrolytic cleaning of such steel, by conclusions reached by an investigation in an English laboratory, and by analogies. The best conditions for the electrolytic removal of oil and dirt from the steel are indicated.

(142) M. E. Parker "Role of Acid Cleaning Agents in Dairy Detergency," *Milk Plant Monthly*, No. 9, pp. 49-52 (1941).

Alkaline detergents have certain disadvantages when used for churn washing; for example, they give rise to the formation of milkstone, which acts as a nutrient medium with consequent survival of proteolytic and oxidative bacteria. Even when such churns contain large numbers of acid producers, the foul odors are definitely of proteolytic origin. The action of gluconic and levulinic acids injected with the steam into churns previously washed with a reliable alkaline proprietary detergent is definitely superior to that of the alkaline detergent alone. Organic acids such as these give pH 6.0 to 6.5 in the churn, with negligible corrosion. High counts of spoilage bacteria were suppressed, odors eliminated, and clean surfaces obtained.

(143) Lewis Shere, "Factors Causing and Methods of Preventing Milkstone Formation," *Milk Dealer*, Vol. 30, No. 6, March, 1941, pp. 33, 56-64.

After discussing briefly the causes of milkstone formation, its control is considered from two angles: (*1*) that of minimizing the formation, and (*2*) proper steps for removing the deposits. General recommendations are made, since different kinds of equipment require different types cleansers.

(144) G. Rogner, "Cleaning and Degreasing of Metals Before Applying Organic or Inorganic Coatings," *Korrosion and Metallschutz*, Vol. 17, No. 6, pp. 204-207 (1941); *Journal*, Inst. Metals, Vol. 10, p. 159 (1943).

Elementary account of the principles and methods for degreasing and cleaning metal surfaces with organic solvents, alkaline degreasing baths, electric cleaners, and mechanical methods.

(145) Tentative Standards and Recommended Practices and Procedures for Spot Welding of Aluminum Alloys, Am. Welding Soc. (1942).

Surfaces may either be mechanically or chemically cleaned. The first step is removal of extraneous soil followed by removal of the resistance film of oxide so that uniform contact resistance will ensue, providing controlled extent of fusion. Removal of extraneous soil may be accomplished by degreasers or alkaline cleaners. Oxide film may be removed, preferably by acids, since the operation can be controlled more closely than by using caustic soda.

(146) "Metal Cleaning as of To-day," *Automotive and Aviation Industries*," Vol. 86, April 1, 1942, pp. 44, 70-75.

"W.P.B. No. 399" release is interpreted as a warning that an impending shortage of chlorinated solvents may make a decided difference in metal cleaning processes in war production plants. The following recommendations are made:

1. W.P.B. release suggests that about 30 per cent of the cleaning operations now being done with chlorinated solvents could be accomplished with the use of other commercially available cleansers such as mineral spirits, alkalies, and nonchlorinated-solvent-water emulsions.

2. Several prominent suppliers of chlorinated solvents and degreasing equipment have ventured the statement that the overloading and overcrowding of machines beyond original capacity cause considerable waste.

3. Focus of attention on the problem should provide a new incentive for a better understanding of metal cleaning in all its ramifications.

Reports from several specialists are summarized, the general opinion being that each plant should make a study of its metal cleaning problems by placing them in the hands of a competent staff metallurgist or chemist. Then follow this with a survey and recommendations by the specialists in the metal cleaning field.

(147) C. J. Bushrod, "General Review of Corrosion of Magnesium and Magnesium-Base Alloys," *Magazine Reviews and Abstracts*, Vol. 3, No. 1, pp. 19-26 (1942); *Metal Industries*, Vol. 61, No. 21, pp. 324-326 (1942).

Discusses corrosion resistance of pure magnesium and of magnesium base alloys containing (*a*) manganese, and (*b*) aluminum, zinc, and manganese, toward atmosphere, sea water, acids, and alkalies. Protective processes and precautions are described. Bibliography of 29 references.

(148) Wilfred J. Clifford and Henry H. Adams (to The Pyrene Co., Ltd.), "Cleaning Metals or Other Surfaces," British Patent No. 543,770; *Chemical Abstracts*, Vol. 36, 6274 (1942).

The metals or other surface are cleaned by spraying the surface with an aqueous solution of a weak acid or salt at a temperature above 120 F. and stopping the spraying when the surface is clean. The pH of the solution should be between 2.5 and 4. As an acid is used H_3PO_4 or an acid phosphate.

(149) C. F. Dinley, "Stabilization of Chlorinated Solvents for Metal Degreasing," *Products Finishing*, Vol. 6, No. 10, pp. 24-26 (1942); *Chemical Abstracts*, Vol. 36, 4931 (1942).

Stabilizers of the organic-base type are soluble in the chlorinated solvent. Volatilize with the solvent vapor during distillation, and condense with the vapor. The boiling point and vaporizing rate of the organic base must be such that the reaction of the chlorinated solvent is always basic regardless of the number of times the solvent undergoes distillation.

(150) J. Edgell, "Corrosion of Aluminum Utensils," *The Electric Times*, Vol. 102, pp. 44-45 (1942); *Chemical Abstracts*, Vol. 37, 4042 (1943).

Corrosion was due to galvanic action between the aluminum and traces of copper dissolved from the piping. An anodic finish obtained by immersing the utensil in 5 per cent H_2CrO_4 at about 38° C. provided satisfactory protection.

(151) E. R. Irwin and J. Teres, "Metal Finishing for Military Aircrafts," *Proceedings*, 30th Annual Convention, Am. Electroplaters' Soc., pp. 134-139 (1942); Discussion, pp. 139-141.

Methods of preparing aluminum and magnesium alloys for surface-protection treatment, such as anodizing, plating, and painting, are described, and brief accounts are given of standard practice in the cadmium plating, lead plating, phosphatizing, and painting of steel.

(152) W. F. Jesson, "Solvent Economy in Trichlorethylene Degreasing Plants," *Metal Industry*, Vol. 60, pp. 254-257 (1942); *Metallurgia*, Vol. 25, pp. 177-178 (1942). Originally presented to the Electrodepositors' Tech. Soc.

The development of degreasing plants is reviewed briefly. Recommendations are made for central control of degreasers and practical suggestions outlined for various ways of preventing waste of the solvents.

(153) "Metal Cleaning in War-time. Magnus Cleaners," Magnus Chemical Co., Garwood, N. J. (1942).

A fifty-page booklet outlining in detail the metal cleaning problems of production for war and indicating the Magnus product best suited for use in each.

(154) Max Metzinger and Alfred Long (to Blockson Chemical Co.), "Detergents Suitable for Use on Metal-Ware with Tin

Surfaces," U. S. Patent No. 2,285,676; *Chemical Abstracts*, Vol. 36, 6707 (1942).

A noncaustic alkaline detergent such as Na_2CO_3 and Na_2HPO_4 is used with about 0.5 to 1.5 per cent of a chromate salt of an alkali metal such as $Na_2Cr_2O_7$ and up to 15 per cent of an alkali metal fluosilicate.

(155) L. H. Minor, "Selection of Detergents," *Southern Dairy Products Journal*, Vol. 32, No. 5, November, 1942, pp. 22, 24.

A short discussion of the various types of dairy cleansers concludes that "the wide variation in the mineral content of water along with the many different types of cleaning to be done makes a universal detergent next to impossible." Points that make a satisfactory detergent are: (*1*) Softens the water; (*2*) prevents precipitation of water minerals which build film and scale formation; (*3*) increases the wetting ability of the water; (*4*) dissolves or softens the milk residues so that they can be removed; (*5*) does not corrode the metal surfaces of the equipment; (*6*) does not attack the hands if it is to be used in hand cleaning; (*7*) is nontoxic; (*8*) does not encourage development of off-flavors to dairy products; (*9*) rinses freely; (*10*) economical to use.

(156) O. M. Morgan and J. G. Lankler, "Evaluation of a Surface Active Agent for Metal Cleaning," *Industrial and Engineering Chemistry*, Vol. 34, pp. 1158-1161 (1942). See reference No. 118.

(157) O. M. Morgan and J. G. Lankler, "Evaluation of Metal-Cleaning Compounds," *Industrial and Engineering Chemistry*, Analytical Edition, Vol. 14, pp. 725-726 (1942). See reference No. 119.

(158) Fred Morris, "Cleaning Alclad for Production," *Aviation*, Vol. 41, April, 1942, pp. 85, 205-206; *Welding Journal*, Vol. 21, April, 1942, pp. 197-198.

One phase of the problem of production spot welding of Alclad involved the development of a method of preparing the surfaces of the metal to secure a satisfactorily low surface resistance between the parts to be welded and to do it consistently. A satisfactory method was developed which permits the parts to be welded at any time within three days after the cleaning operation, and also gives consistent results as far as weld strengths are concerned. The details of the operation are given.

(159) Claudius Nielsen, "Streamlined Cleaning of Metal Surfaces in War Production," *Industrial Finishing*, Vol. 18, No. 2, pp. 31-40 (1942).

Examples are given in which trisodium phosphate is used. Suggests compositions to be tested at 6 oz. per gal. at 212° F. Panels dipped in SAE No. 50 lubricating oil, removed, drained 1 hr. at room temperature, then immersed in boiling cleaning solution. Must also strip zinc chromate primer and lacquer without attacking aluminum. Gives two formulas, one for power washers and one for still tanks.

(160) T. E. Piper, "Preparation of Aluminum Alloy for Spot Welding," *Welding Journal*, Am. Welding Soc., Vol. 21, No. 10, pp. 661-664 (1942); *Journal*, Inst. Metals, Vol. 10, p. 61 (1943).

Describes method for cleaning and etching of aluminum alloy assemblies as a unit, using phosphoric acid with a cleaning agent.

(161) R. S. Pratt, "Heat-Treating Brass Cartridge Cases," *Steel*, Vol. 111, No. 9, pp. 48-49 (1942).

Curves show mechanical properties resulting from various combinations of cold working and annealing. Cleaning with alkalies is necessary to prevent corrosion by powder stored within the case in fixed ammunition.

(162) Gilbert Robinson, "Hot-dip Galvanizing Technique. Part III: Soap Removing and Degreasing," *Wire Industry*, Vol. 9, pp. 373-375 (1942); *Chemical Abstracts*, Vol. 36, 6991 (1942).

A schematic drawing of a continuous hard soap drawn-wire degreasing bath is shown and features of the degreasing bath and the daily solution check are discussed.

(163) Lewis Shere, "How to Prevent and Remove Milk Deposits," *Food Industry*, Vol. 14, July, 1942, pp. 63-66.

Describes suitable cleansing routine to remove milkstone deposits and prevent their subsequent deposition.

(164) Henry Strow, "Metal Cleaning in War-Time," *Monthly Review*, Am. Electroplaters' Soc., Vol. 29, pp. 995-1002 (1942).

Two basic cleaning problems for aluminum prior to spot welding are preparation for anodizing and for welding. Attack on metal is controlled to give slight attack to help in carbonized oil removal. For frosted finishes strong alkalies are used and the degree of each is controlled carefully. Nitric acid has been used to remove the black smut from aluminum, after treatment in alkali, and addition agents have been marketed to give a clear white color to the surface. In spot welding the oil and grease must first be removed, then the oxide film is acid removed. Magnesium is cleaned by "steel" cleaners because of its resistance to alkali.

(165) J. F. J. Thomas, "Inhibition of Corrosion of Aluminum and Other Metals in Soda Ash," *Canadian Journal of Research*, Vol. 21, No. 2, B, pp. 43-53 (1942); *Metal Abstracts*, Vol. 9, p. 280 (1942); *Journal*, Inst. Metals, Vol. 10, p. 211 (1943).

Immersion for two hours at 60° C. in solutions of soda ash to which are added various inhibitors, total salt concentration of 0.5 per cent. Inhibitors were various sodium silicates, sodium silicofluoride, organic bodies.

Sodium orthosilicate had no inhibiting effect on aluminum or duralumin, sodium meta silicate (Metso) gave complete freedom when concentration was 17.5 per cent and upwards of total concentration. Sodium silico fluoride effective at 7.5 per cent and upwards of total concentration.

Attack of galvanized iron inhibited by metasilicate, but not by silicofluoride. Higher concentration of silicofluoride (40 to 60 per cent) needed for tin plate. At higher temperatures higher percentages of inhibitor are needed.

(166) J. F. J. Thomas, "Corrosion Resistance," *Canadian Chemistry*, Vol. 26, pp. 169-171 (1942); *Journal*, Inst. Metals, Vol. 10, p. 15 (1943).

Investigation of laboratory corrosion test methods. Interpretation of laboratory results for actual service conditions discussed. Types of attack on various metals considered, with specific reference to aluminum alloys. Inhibition of corrosion investigated and methods of protection of various alloys recommended.

(167) "Proposed Methods of Chemical Analysis of Industrial Metal Cleaning Compositions," *Proceedings*, Am. Soc. Testing Mats., Vol. 42, pp. 407-422 (1942).

Suggested methods of analysis are proposed, as a means for chemical evaluation and control of cleaning compositions.

(168) S. H. Barmasel, "Surface Protection of Magnesium," *Iron Age*, Vol. 151, No. 16, pp. 44A-44D, 1943; *Chemical Abstracts*, Vol. 37, 3387 (1943).

Any of the well-known methods of solvent or alkali cleaning can be used to degrease magnesium surfaces. Alkaline cleaning can be accomplished either by boiling or by a cathodic electrolytic process in an alkaline solution. The following solution is recommended: 4 oz. of Na_3PO_4, 4 oz. Na_2CO_3, and H_2O to make 1 gal. This solution should be kept at 194 to 212° F. when in use, and can be used without agitation and at temperatures below the boiling point in the electrolytic cleaning process. The magnesium object is the cathode, current density is 10 to 20 amp. per sq. ft. For solvent cleaning, gasoline, trichloroethylene, naphtha, and CCl_4 are good. Alkaline solutions containing soap should not be used unless the magnesium surface is subsequently to receive a dichromate treatment. When exposure to sea air or saline solutions is expected, chemical surface protection should be provided. For this purpose the magnesium part can be dipped in a solution containing 1.5 lb. $Na_2Cr_2O_7$, 1.5 pt. concentrated HNO_3, and H_2O to make 1 gal., used at room temperature or up to 150° F. if desired. The time required is 30 sec. to 2 min., depending on the age of the solution. After this treatment the part should drain for 5 to 20 sec., and be rinsed in cold water to 180° F. If the time of dipping has been correct, the magnesium will have a yellow or a red-yellow iridescent hue. The dipping solution can be revived by addition of HNO_3. Resistance of magnesium alloys to salt water is considerably increased if the metal parts are simply boiled for 45 min., in a 10 per cent dichromate solution. This can be preceded by a dip in 15 to 20 per cent HF solution. Dichromate treatment should not be applied to alloys containing manganese. When the alloys contain magnesium they should be anodized. They are first given a dip in HF solution, washed in cold water, and then anodized at 2 to 10 amp. per sq. ft. in a bath containing 3 per cent $(NH_4)_2SO_4$, 3 per cent $Na_2Cr_2O_7$, and 0.25 per cent NH_4OH (sp. gr. 0.880). After this treatment the parts are boiled for five or more minutes in H_2O containing 1 per cent As_2O_3 by weight. This gives a black or dark brown coat.

(169) F. A. Champion, "New Methods for the Examination of Corroded Metals," *Jour-*

nal, Inst. Metals, Vol. 10, pp. 47-66 (1943).

Scheme of classification:

General corrosion { even / uneven

Local corrosion { even / uneven / pitting { wide / medium / narrow } / cracking }

Used macro and microscopic means for the observation with charts for comparison.

Description of radiographic means for examination and application of photometric measurement of corroded area. Neither fully exploited as yet, but their use offiers quantitative means for measurement.

(170) T. J. Coleman (to Canadian National Carbon Co., Ltd.), "Metal-Cleaning Composition," Canadian Patent No. 412,896 (1943); *Chemical Abstracts*, Vol. 37, 5522 (1943).

A composition for removing scale, oxide impurities, grease, and oil from metal surfaces while preventing acid attack on surfaces of aluminum, brass, copper, tin, and antimony consists of a mixture of about 85 per cent of a water-soluble bisulfate, 6 per cent of a water-soluble organic sulfonation product, 5 per cent of a water-soluble sulfate, and about 4 per cent of $(NH_4)_2HPO_4$.

(171) Herbert K. De Long (to The Dow Chemical Co.), "Cleaning Rolled Magnesium Articles," U. S. Patent No. 2,302,939; *Chemical Abstracts*, Vol. 37, 2332 (1943).

A method is employed for removing carbonized oil containing oxide mill scale from the surfaces of rolled articles of magnesium and magnesium alloys which involves subjecting the article to the action of an aqueous solution of a water-soluble organic carboxylic acid such as acetic, citric, or tartaric acid for a time sufficient to remove the scale but insufficient to permit any substantial attack on the metal.

(172) A. Douty and E. Snyder, "Cleaning Steel for Finishing," *Metal Finishing*, Vol. 41, No. 11, pp. 754-757 (1943).

"Clean" surfaces may have visible contaminants removed, but invisible contaminants, as from alkaline materials in the rinse bath, may remain and ruin adhesion of painted coatings. Even undiscolored, silvery white surfaces while still damp should be suspended. Invisible contaminants, classified as immediately and latently harmful materials, may be:

1. Alkalies and alkaline salts.
2. Alkaline earth metals (hard water).
3. Salts of iron, such as chlorides and sulfates from pickling operations.

Cleaning methods and relative merits:

A. Mechanical.—Pits not cleaned.

B. Vapor Degreasing. — Leaves film of iron chloride.

C. HCl or Sulfuric Acid Pickling.—Iron salts remain as a rust. 'Blush" unless given full final rinse in alkali.

D. Alkaline Cleaning.—Traces remaining deleterious to paint life.

E. Phosphate Acid Type Cleaning.—Highly desirable because traces of remaining phosphoric acid are beneficial to paint life.

Final rinse is highly important and simple tap water rinse is never satisfactory. Proper rinsing conditions given as follows:

1. Contain either phosphoric acid or chromic acid in very dilute solutions in 0.01 to 0.10 per cent concentration.
2. pH value between 3 and 5.
3. Presence of a suitable agent to cause suitable draining of rinse water.
4. Should be controlled to contain minimum amount of soluble iron salts.
5. Should be hot, preferably boiling and articles left in long enough to attain this temperature.
6. Arrange work for complete drainage.
7. If work does not dry immediately after removal it should be artificially dried.

(173) A. Elder, "Ground Glass for Spot Testing in Solvent Extractions," *Industrial and Engineering Chemistry*, Analytical Edition, Vol. 15, p. 282 (1943).

Depends upon spot or line produced when a solvent containing oil is allowed to evaporate on ground glass plate of photographic grade. Sensitivity of 0.005 per cent. Test surface gives a transparent spot or circular hair line.

(174) "Cleaners for Effective Metal Cleaning," *Bulletin C-105*, Hanson-VanWinkle-Munning Co. (1943).

Describes laboratory apparatus for the evaluation of either soak or electrified cleaners. The equipment provides for positive circulation (by pump) and an overflow bath. Recommends a titration method for determining the effective remaining alkali in the cleaning bath. Use of a laboratory centrifuge (to remove insoluble soil from the used cleaning bath), the control cleaning appartus, and the titration analysis serve to decide the period at which the bath should be discarded. The effects of variation of current density, temperature, and concentration upon the cleaning rate of electric cleaning are illustrated.

(175) H. O. Klinke, "Surface Treatment of Aluminum Alloy Assemblies Prior to Spot Welding," *Welding Journal*, Vol. 22, August, 1943, pp. 603-604.

It is desirable to treat the surface of aluminum alloy assemblies rather than the individual components, and a series of tests to determine the production possibilities is described. The aluminum alloy parts were held by a few rivets or small bolts and cleaned at room temperature in a phosphoric acid solution (50 per cent nominal) plus a wetting agent. Spot welds made after such cleaning gave satisfactory test figures, and it was apparent that the solution crept between the faying surfaces. Contact resistances were measured and curves reproduced for Alclad 24S-T assemblies for 0.064 and 0.030-in. material.

(176) Vernon A. Lamb, "Cleaning and Pickling," *Metals and Alloys*, Vol. 17, January, 1943, pp. 86-87.

A review of developments during 1943, with a bibliography of 17 references.

(177) P. D. Liddiard, "Determining the Cleanliness of a Metal," *Metal Industry*, Vol. 63, August 27, 1943, pp. 130-131.

Tests developed and used in the study of degreasants are summarized. Although many of them are applicable in certain circumstances, they will, nonetheless, be of considerable interest to those engaged in the treatment of metal surfaces. The term "degreasing" is defined and considered in two stages: (*1*) the removal of surface deposits of oil from the solid surface and (*2*) the removal of adsorbed layers of oil. Tests for grease freedom are discussed under headings: Direct observation; surface tension; selective staining; solvents; decomposition; and electroplating. A brief reference is made to the residues of degreasants.

(178) R. B. Mears and G. G. Eldredge, "The Use of Inhibitors for Aluminum Chemical Equipment," *Transactions*, Electrochemical Soc., Vol. 83, 15 pages (1943).

A classification of inhibitors according to their effectiveness and their influence on the intensity and area attacked is given. The electrochemical behavior of inhibitors is discussed and the factors that cause an inhibitor to be safe or dangerous are outlined. A series of laboratory tests to determine the effectiveness of various chemicals as inhibitors of the attack of aluminum and the aluminum-base alloys in acid, alkaline, and neutral solutions are described. Organic substances such as soluble oils, alkaloids, and organic sulfur compounds proved to be effective inhibitors in HCl. Chromates, soluble oils, and commercial wetting agents appeared to be best in H_3PO_4. No highly effective inhibitors for H_2SO_4 were found. In alkaline solutions, the silicates were the most promising inhibitors. Chromates and soluble oils were the most effective inhibitors found for nearly neutral solutions. However, even these substances were not effective for preventing galvanic attack by waters containing appreciable concentrations of chlorides. Service applications of inhibitors for protecting aluminum chemical equipment are described, particular attention being given to the inhibiting action of an alcohol cooling fluid. Hot Na_2CO_3 solutions require 22 per cent by weight of $Na_2O.2SiO_2$. Hot Na_3PO_4 solutions require 30 per cent by weight of $Na_2O.2SiO_2$.

(179) Oliver M. Morgan (to Allied Chemical & Dye Corp.), "Cleaning Metal Surfaces such as Those of Iron or Steel," U. S. Patent No. 2,314,285 (1943); *Chemical Abstracts*, Vol. 37, 5010[4] (1943).

For removing greasy residues, the metal to be cleaned is immersed in a hot aqueous alkaline cleansing bath such as one of NaOH, Na_3PO_4, Na_2CO_3, and Na_2SiO_3 containing, per gallon of water, 0.125 to 1.0 oz. of Na heptyl-naphthosulfonate or other alkyl aromatic sulfonate having at least 7 C atoms in an alkyl radical, as a cleansing assistant and as an emulsifying agent for the residues, while an electric current is passed through the metal as an electrode.

(180) R. W. Mitchell and Marcel T. Zinty, "Metal-Cleaning Solutions. What They Are, How to Use Them, and Why," *Machinist*, European Edition, Vol. 87, pp. 105-107 (1943).

Metal cleaning solutions are grouped into

four major classes: Alkaline cleaners, solvent cleaners, petroleum spirit cleaners, and the newest development, emulsifiable cleaners. The advantages and disadvantages of each, and its ability to meet the requirements of a metal cleaner, are described.

(181) M. E. Parker, "Acid Detergents in Food Sanitation," *Industrial and Engineering Chemistry*, Vol. 35, January, 1943, pp. 100-105.

The discovery of organic acids with relatively low corrosiveness and inherent inhibiting effects upon the quality-defective types of microorganisms first pointed the way to developing acceptable types of acid cleaners. The effective combination of such acids with surface-active agents and corrosion retarders has resulted in the development of acid cleaning compounds possessing a detergency superior to that of most alkaline products, as well as providing an incidental wash water treatment, both corrective and curative, for the problem of water-stone and other calcareous formations. Therefore, acid cleaners promise not only a revision but an even greater improvement in the sanitary practices of food industries.

(182) M. E. Parker, "Manual of Dairy Detergents and Cleaning Practices," *Food Industries*, Vol. 15, July, 1943, pp. 78-80, 135; August, 1943, pp. 71-72, 131; September, 1943, pp. 66-67.

Part I discusses the attributes and shortcomings of the various types of dairy washing compounds. A table giving average water hardness in the United States and Canada is included in this part. Part II considers wetting agents, polyphosphates, and abrasives. The trade names and manufacturers of dairy cleaners are listed. Part III gives practical directions for cleaning cream cans, separators, and farm utensils. These include step-by-step instructions for this important phase of dairy sanitation.

(183) H. P. Quadland, "Industrial Degreasing Agents," *Metal Finishing*, Vol. 41, July, 1943, pp. 463-465; *Metal Industry*, Vol. 63, p. 220 (1943).

A short review of fire and explosion hazards, toxicity, availability, and costs involved in the principal methods of degreasing.

(184) Campbell Rutledge, Jr. (to General Chemical Co.), "Detergent Composition," Canadian Patent No. 411,280 (1943).

A detergent, particularly for aluminum and tin articles, consists of an aqueous solution of Na_3PO_4, Na_2SO_3, and sodium silicate having a SiO_2, Na_2O ratio of 2 to 4. Strips of aluminum weighed, then immersed in the cleaner solution at 150° F. for ½ hr. in solution from 0.10 to 5.00 per cent by weight. The strips then are removed, weighed, and loss calculated in milligrams per square inch per ½ hr. at 150° F.

(185) Ray Sanders, "Chemicals That Aid in Aircraft Production," *S.A.E. Journal*, Vol. 51, January, 1943, pp. 23-30.

Methods for protecting alloys 17S-T, 24S-T, and Alclad 24S-T from corrosion and the determination of the relative adhesion of paints on the same alloys including a discussion of cleaning treatments. The value of precleaning in removing the greater part of the soil, oils, and lubricants before entering the final cleaning tanks is pointed out. Emulsion degreasing, vapor degreasing, mechanical washing machines, and auxiliary hot tanks are also discussed. The differences in cleaning and treating methods to be employed with aluminum and magnesium alloys are brought out and the preparation of steel, copper, or brass for cadmium plating and of aluminum alloys for spot welding is discussed at some length.

(186) W. S. Simmie, "Inspection of Cleaning Methods for Light Alloy Sheets," *Welding*, Vol. 11, November, 1943, pp. 462-463.

Aluminum alloy sheets required to be cleaned prior to spot welding and also in order to obtain a surface to which paint will adhere. Chemical methods are used largely for such pretreatment, and a new method of testing the efficacy of the treatment is described. The apparatus consists of a low-reading cross-coil ohmmeter, a 10-amp. 2-v. battery, and a pair of copper electrodes, the bottom die being fixed and the upper capable of controlled movement. The test piece is placed between the electrodes and the resistance is measured. Typical results are included.

(187) Robert Sizelove, "Development of Cleaning Materials in 1942," *Monthly Review*, Am. Electroplaters' Soc., Vol. 30, pp. 54-56 (1943).

Shell fuse parts of aluminum cleaned either by degreasing or by mild alkali soaking. Alkalies preferable because of deleterious action of aluminum upon degreasing solvent, but this may be eliminated by proper operation of the degreaser.

(188) Maxwell Stiles, "Cleaning Steel, Brass, Bronze, and Copper," *Industrial Finishing*, Vol. 19, No. 4, pp. 38-48; No. 6, pp. 14-18 (1943).

Directions are given for cleaning steel, magnesium alloys, brass, bronze, and copper, using the electrolytic cleaning method, sandblasting, brushing, pickling, vapor degreasing, passivating treatment, and hydrocarbon and aqueous solvents. Aluminum cleaned prior to anodic treatment in an inhibited alkaline cleaning preparation, then through a hot water rinse, through the chromatizing or anodizing bath, followed by a final rinse (containing chromic acid for neutralization), then to a drying station. In other cleaning processes the final rinse is neutralized and the pH of the rinse water is held below 6.8 by use of chromic acid. Details are given for cleaning procedures prior to other operations such as welding or paint coating.

(189) Henry Strow, "Evaluation of Metal Cleaners," *Metals and Alloys*, Vol. 18, September, 1943, pp. 503-505.

Significant factors for evaluating cleaning efficiency are considered briefly under pH, emulsifying power, surface tension, and buffering action. The test for cleaners recently developed by Morgan and Lankler is described briefly as being the most satisfactory at the present time. Determination of the life of a metal cleaner is also an evaluating factor.

(190) F. W. Van Antwerpen, "Surface Active Agents Manufactured in America and Commercially Available," *Industrial and Engineering Chemistry*, Vol. 35, January, 1943, pp. 126-130.

A tabulated list which has appeared before in this journal. See Vol. 31, January, 1939, pp. 66-69 and Vol. 33, January, 1941, pp. 16-22.

(191) Camille Dreyfus, Canadian Patent No. 416,965; *Soap*, Vol. 20, No. 2, p. 67 (1944).

A liquid for cleaning aluminum contains 6 to 25 parts of soda alum, 0.2 to 5.0 parts of a detergent, and about 100 parts water.

(192) Compound, Cleaning: For Painted Surfaces, Bureau of Ships Ad Interim Specification 51C20 (INT).

Tests include measurement of reduction in gloss of painted panels, and the photometric measurement of cleaning efficiency utilizing a special washability apparatus. A standard soil comprising metallic brown, kerosene, carbon tetrachloride, Nujol, forced-feed lubricating oil, and hydrogenated vegetable shortening is applied to panels, baked at 100 to 105° C. for ½ hr.

(193) Detergent, Dishwashing, Bureau of Ships Ad Interim Specification 51D8 (INT).

Corrosion tests for aluminum alloy sheet.

(194) Ether, Alkylated, Phenolic (For Cleaning Aircraft), Navy Aeronautical Specification RM-70, February 7, 1938.

Evaluation of interfacial tension, deflocculation of Norit carbon, stability, and panel tests with aluminum alloy sheet.

(195) Compound, Cleaning: Aircraft, Air Corps Specification No. 20015-B, October 12, 1940.

Tests compound with 24S-T aluminum alloy for corrosion resistance, cleaning power against a composition comprising asphalt, aircraft engine oil, kerosene, xylene, and powdered rottenstone which is baked at 143 to 150° C. for 3 hr. Also includes a rinsing test.

(196) Cleaner, Alkaline, Heavy Duty for Hot Tank Parts and Radiator Cleaning, Holabird Ordnance Motor Base Specification ES-382a, February 6, 1941.

Includes solubility and rinse tests.

(197) Compound, Paint Stripping, Noninflammable, Navy Aeronautical Specification C-113, September 22, 1941.

Tests include stripping properties, and corrosiveness.

(198) Compound, Paint Stripping (Silicate Type), Navy Aeronautical Specification C-67d, September 23, 1941.

Tests include stripping and rinsing properties.

(199) Paint, Stripper, Alkali, Tank-Automotive Center, Tentative Specification ES-No. 452a, February 6, 1941.

Tests include surface tension, hydrogen-ion concentration, rinsing, solubility, and stability.

(*Concluded on page 495*)

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Electroplating and Anodizing Equipment Under New Order The allocation of all electroplating and anodizing equipment is now under Limitation Order L-123 as amended July 14, 1944. Upon the issuance of this amended order General Limitation Order L-110 was revoked. Even though the allocation of plating equipment has been brought under another order that part of the order which deals with plating equipment will continue to be administered by Charles Rice, Chief of the Electroplating and Anodizing Section. The new M. F. order contains only a few minor changes in allocation procedure and definition from Order L-110. In fact, it is the same as Order L-110, except for the elimination of a few unimportant words in the definition and the deletion of the sentence: "The term shall also include repair parts for any such items." Under this new order it will not be necessary to use form WPB-541. Field offices will be given the power to grant allocations up to $25,000; and new instructions on plating equipment allocation are being prepared for field officers.

Plating Equipment Manufacturing Reconversion Being Considered To stimulate reconversion in the electroplating and anodizing equipment manufacturing industry the War Production Board is in the process of establishing a number of methods of procedure. For example, electroplating and anodizing equipment manufacturers may be given permission to get materials to make models of any type or types of machines or pieces of equipment they propose to make and sell in the post-war period. Second, they may receive orders for machines and equipment for delivery after the war. Third, they may be given permission to manufacture and fill orders if they have the materials and available manpower provided such manufacturing does not interfere with the war production program. Fourth, the consumers may be given permission to give direct orders to the manufacturers for plating equipment without making application to the WPB. And fifth, the buyers may be given permission to make application for the contemplated rating of AA-6 on plating equipment. Under the AA-6 rating the manufacturers may be given permission to make the equipment when manpower and materials are available, but delivery must be held in abeyance until after the war.

Plating Overhead Costs of Two-Fold Character Recently it was asked if there is a fool proof method of estimating proper overhead costs in a plating job estimate or bid. Before one answers that question it should be stated that the overhead problem is of a two-fold character. First, there is the question of shop policy; and second, there is the question of shop accounting method. Both are important and neither can be separated from each other.

Constant and Variable Overhead Costs Obviously, overhead should consist only of those costs which are difficult to directly trace to a particular job or process. And what is more, ordinary common sense tells one that some costs such as interest on a shop's mortgage, annual rental, depreciation, and fire insurance, may be said to be constant overhead costs. And such costs as repair and maintenance, light, heat, power, income and real estate taxes, social security, compensation insurance, and administrative, advertising and selling expenses, all of which are materially affected by shop policy, may be said to be variable overhead costs.

Reasons for Overhead Cost Variances Some of the causes for overhead costs variances are imperfect office materials, faulty planning of work and facilities, the annual percentage of shop utilization, the amount of competition and extent of cooperation, and the geographic location of the shop. More than that, the number, kinds and sizes of articles and kinds of plating service offered will affect the cost of overhead. Then, too, even the same type of machine or equipment will not respond the same way under all conditions because of local habits and customs and because of the variable capacity and efficiency of workers and supervisors due to their mental and physical condition.

Cost Accounting Reveals Variances In Overhead Costs All of these causes for variances in overhead costs are revealed by cost accounting (not financial accounting), which is founded on the theory that each phase of a business, such as pickling, rinsing and buffing in the electroplating business, should be self-sustaining and independently profit-making. But before the plater can accomplish this objective in his shop he must be willing to spend more time measuring the floor space occupied for each phase of his business; he must keep an accurate account of kilowatt hour consumption in each phase of operation; he must value and segregate his equipment by departments or processes; he must keep a record of the manhours and equipment hours for different phases of operation; and he must see to it that each dollar of overhead cost is properly allocated.

Bases of Bidding On Plating Jobs Once the total costs of each phase of operation are known, based on a few years of cost knowledge, the overhead costs which should be included in a job bid can be estimated with a reasonable amount of accuracy, irrespective if the shop's estimates are premised on the basis of (1) all the traffic will bear; (2) benefit and use of the service, and (3) stimulus to obtain maximum utilization of the shop.

Post-War Platers Employment Problem During the war, and after, jobs must be found for the millions of returning veterans. In fact, one wonders how many metal finishing workers now in the armed forces will be able to return to their former jobs. Some may be physically or mentally unsuited for their old jobs. Others may have no inclination to return to their pre-war metal finishing occupation. And some may like to return to the metal finishing business but cannot for the lack of work. Where can these pre-war and military metal finishers fit into the scheme of things in the post-war period? This is not an easy

problem. But, something must be done to aid these platers and the millions of others who will eventually return for civilian occupations.

WMC's Electroplaters Job Studies The War Manpower Commission recognizes that this is a serious problem which must be solved to prevent chaos and trouble. For this reason the Division of Occupational Analysis and Manning Tables of the WMC's Bureau of Manpower Utilization has been busy for some time making job family studies on related occupations to (1) Silverware manufacture; (2) Jewelry manufacture; (3) Tinware manufacture, and (4) Electroplating. And on August first it will issue a 500-page manual on "Special Aids for Placing Military Personnel in Civilian Jobs" which will be used as a job placement handbook in the 1,500 local offices of the United States Employment Service.

Placement Counsel Service To put this another way this manual will be used by the local offices in giving counsel to veterans (1) who lack civilian experience and training; (2) who have less civilian than military experience and training; (3) who are unable to return to their former civilian occupations because of physical handicaps; (4) who lack present opportunities in their former civilian occupations, and (5) who wish to make a change in their civilian occupation.

Job Matching Factors More than that this manual analyzes each military occupation to see where it is related to groups of civilian jobs. First, it describes the qualifications, functions, materials, and tools used in the military occupation. Then it matches this occupation with related occupations. This is accomplished (1) by matching each occupation in terms of work done; (2) by analyzing the tools used; (3) by examining the materials used or worked with, and (4) by making an inquiry into the background required for each particular occupation. This is then reduced in terms of the particular veteran's characteristics such as adaptability with a minimum of training.

Job Placement Manual All of this information is recorded in the manual under each military occupation under such heads as (1) the related civilian occupations; (2) the additional training required to fit into the civilian occupation; (3) the physical activities of the related job such as bending, figuring, fingering, handling, hearing, pulling, pushing, reaching, seeing, standing, sitting, talking, turning and walking, and (4) the working conditions of the occupation such as dampness, dirtiness, dryness, dustiness, inside work, noisiness, outside work, temperature, and toxic conditions.

Electroplaters Related Jobs It is interesting to observe that this manual points out that the related occupations in which a military electroplater may use his background and experience are such jobs as acid man, acid tester, anodic operator, automatic re-dipper tinner, bench grinder, buffer, chemical laboratory assistant, colorer, disk grinder operator, enameler, galvanizer, inspector, laboratory tester, lead coater, plater, polisher, sandblaster, silverer, surface treater and wire tinning machine operator.

Contractors Guide Issued by Army The War Department has issued a new booklet called "The Contractors Guide—Suggestions to War Contractors as to Methods of and Preparation for Contract Terminations Applying to Fixed Price Supply Contracts for the War Department." This booklet, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from the Readjustment Division, Army Services. It is divided into three parts. The first part is the ABC of contract termination treating on such subjects as purpose and scope of contract termination, the basis of contract termination, the methods of settlement, what costs can be included, what the contractors should do before termination with their own organizations, with the Government and with subcontractors. The second part deals with such subjects as notice of termination, partial payments, inventories, disposal of surpluses, subcontractors' claims, prime contractors' claims, and final settlement. And the third part is devoted to a reproduction of facsimilies of the new uniform termination forms.

Renegotiation Regulations Manual Issued During the past month the Superintendent of Public Documents released a loose-leaf manual on "Renegotiation Regulations" as issued by the War Contracts Price Adjustment Board. The present volume is 275 pages in length. Supplements will be available for insertion in the manual as they are issued from time to time. The prepaid subscription price for the manual, including 12 monthly supplements, is $2.00.

Limited Reconversion Orders Issued On July 11, 1944, Executive Vice-Chairman Charles E. Wilson of the WPB, announced that four orders would be issued to enable industry to prepare now for limited reconversion. An order will be issued on July 15, 1944, which will lift some of the current restrictions on the use of aluminum and magnesium. On July 22, 1944, an order will be issued granting permission to make a minimum number of models for strictly experimental purposes. However, if the proposed expenditure for any model for any month exceeds $5,000 the specific approval of the WPB and the War Manpower Commission will be required. All materials for such experimental purposes will be given an AA-3 rating. An order permitting the placing of unrated orders for machine tools and equipment will be issued on July 29, 1944. And on August 15, 1944, an order will be issued which will set up procedures for individual manufacturers who have the facilities and manpower for war production. This order will also deal with the procedure of obtaining available materials for the production of civilian products.

Small Businesses To Be Given An Opportunity Maury Maverick, Chairman of the Smaller War Plants Corporation, has received the approval of a plan which is designated to give small plants a greater participation in essential civilian production. Under this plan small plants will be granted partial relief from production quota restrictions. The plan provides that small plants will be permitted to increase their rate of production equal to the over-all industry rate of production for any given civilian item. All Controlled Materials Plan and other applications, which are to be filed for participation in the program must be accompanied by form SWPC-2. Owners and operators of small plants should get in touch with the regional office of the Smaller War Plants Corporation.

Surplus Property Legislation Is Expected Soon One of the first things Congress will give attention to when it reconvenes, will be the enactment of legislation on the disposition of surplus property and on the endorsement of the administrative procedures which have already been set up by Aministrator Will L. Clayton. The accumulation of surplus is piling up, but thus far the disposition has been on a sort of "at random" fashion. We must get ready now because it will be dangerous to wait until a great avalanche of surplus goods moves down on business and industry.

Bognar Has An Addition to His Family John J. Bognar, Chief of the Finishing and Treating Section of the Repair Shops Branch of the Service Equipment Division of the War Production Board, has a new little permanent guest at his home. Bognar took off a week to celebrate the delivery of his baby boy.

Promisel and Williams Appointed to Important Research Committee On July 1, 1944, the National Advisory Committee for Aeronautics appointed a Committee on Materials Research Coordination. N. E. Promisel, Chief Metallurgist of the Bureau of Aeronautics, who is well known in the metal finishing industry, was made a member of the committee. The main functions of this committee are "A. To collect, analyze and disseminate information on aircraft materials research and development. B. To arrange to receive information concerning pertinent investigations bearing on specific problems and to consider and recommend new projects outlining the scope and suitable locations for conducting the needed research. C. To administer the proper distribution of aircraft materials research reports." Clyde Williams of Battelle Memorial Institute was also appointed a member of the committee.

Aluminum for Lighting Fixtures Is Expected The WPB Incandescent Lighting Fixture Industry Advisory Committee, at its July 3, 1944 meeting, was informed that there will be a relaxation of the restrictions on the use of copper for lighting fixtures only where the quantities involved are small and where the war effort will not be impeded by such relaxation. WPB officials said that permission may be given soon for the making of lighting fixtures from aluminum.

Aluminum Kitchen Utensils Program Established At a recent meeting of the Aluminum Utensils Industry Advisory Committee of the WPB it was revealed that a program for the production of aluminum household kitchen utensils to meet minimum essential needs has been established. It appears that toward the later part of 1944 there will be a limited production of sauce pans, sauce pots, dutch ovens, fry pans, griddles, kettles, double boilers, percolators, drip coffee makers, bake pans, roasters and colanders.

Bismuth Order Amended Conservation Order M-276 was amended on July 5, 1944, for the purpose of redefining bismuth to include primary alloys containing bismuth. It also raised from 50 to 100 pounds the amount of bismuth which may be delivered to any one consumer in any one month. According to the amended order WPB authorization is required for the use of any amount of bismuth in excess of 100 pounds. Form WPB-2278 must be used for amounts in excess of 100 pounds of bismuth.

Chromium Plated Steel for Reflectors Permitted To eliminate confusion the WPB announced on July 13, 1944, that the use of chrome-plated steel for heat reflectors in radiant reflectors is permitted by Order L-23-c. This interpretation was given to the order because it was found that the use of any substitute material for heat reflectors resulted in high floor temperatures and increased fire hazard.

Corundum Still Tight War Production Board officials told the Corundum Industry Advisory Committee on July 15, 1944, that the corundum ore is still "in short supply despite the relatively satisfactory picture of the balance sheet." Officials of the WPB believe the production at the Montana mines may relieve the situation this autumn.

Galvanized Ware Discussed By Committee At the Galvanized Ware Manufacturers Industry Advisory Committee on July 13, 1944, the members of the committee were told by WPB that the difficulty of supplying enough steel to the industry is increasing, because of the demands made by the armed forces for steel sheets. Manufacturers were urged "(1) To determine the optimum thickness of galvanized ware items for specific uses; (2) To apportion production of the different types, weights and sizes of galvanized ware in accordance with varying needs, and (3) To distribute galvanized ware in such a way that each type of consumer will receive items of the proper type and quality for his purpose."

Galvanized Ware For Civilians Eased An increased use of iron and steel for the making of galvanized ware for civilians was granted by amending Limitation Order L-30-a on June 21, 1944. According to this amended order eight classes of galvanized ware may be made for civilian use such as garbage and ash cans and pails; pails; buckets; washtubs; wash boilers; fire shovels; coal hods and scuttles; and petroleum product cans.

No Increase in Metal Cans Contemplated According to WPB officials, there will be no increase in the production of metal cans and metal shipping drums for civilian goods in the near future because of the great demand for landing barge plates, aircraft landing mats and shell cases.

Mutual Chemical Company Expands Facilities The Defense Plant Corporation announced on July 1, 1944, that it had executed a contract with the Mutual Chemical Company of America, Baltimore, Maryland, to provide machinery and equipment at cost of $150,000. The Mutual Chemical Company will operate the facilities but the title will remain in the name of the Defense Plant Corporation.

Navy Saves Metals On June 21, 1944, the Navy Department's Bureau of Ships announced that its conservation program has resulted in the saving of 30,000,000 pounds of nickel; 20,000,000 pounds of rubber; 9,000,000 pounds of tin; 42,000,000 pounds of aluminum; 207,000,000 pounds of copper; 65,000,000 pounds of bronze, and 38,000,000 pounds of brass.

Nickel Plating Permitted on Spectacleware General Limitation Order L-214, Schedule 2, as amended July 2, 1944, has eased the restrictions on the use of nickel and nickel-bearing alloy in the manufacturing of corrective spectacles. According to this amended order nickel silver may now be used in any part of metal spectacleware and xylonite spectacleware, including screws and dowels. The parts must not contain more than 10 per cent nickel in the alloy and not more than 18 per cent in screws and dowels. The amended order permits the use of nickel plating of "white metal" spectacleware.

OPA Galvanized Ware Committee Appointed On July 13, 1944, ten manufacturers were appointed to the OPA Galvanized Ware Manufacturers Industry Advisory Committee. The members of the committee are E. P. Altemeier of the National Enameling & Stamping Co. of Milwaukee, Wisconsin; David Kamenstein of M. Kamenstein, Inc. of Long Island City, N. Y.; W. H. Nesbitt of the Wheeling Corrugating Co. of Wheeling, West Virginia; George W. Witt of The Witt Cornice Co. of Cincinnati, Ohio; George W. Schott of the Cincinnati Galvanizing Co. of Cincinnati, Ohio; L. S. Cleaves of the Dover Stamp and Manufacturing Co. of Cambridge Massachusetts; Arthur S. Kendall of the Crunden Martin Manufacturing Co. of St. Louis, Missouri; Willard H. Richardson of M. A. Richardson, Inc. of Chicago, Illinois; A. F. Wilson of Savory, Inc. of Buffalo, N. Y.; and John Hauerwaas of the United States Steel Products Co. of New York City.

OPA Officials Dictate Letters by Telephone Washington is astonishingly full of new ideas. It recently established a service whereby an OPA official can dictate his letters to a stenographer by telephone. If he forgot to wind his alarm clock all he has to do is call up the OPA from his home, ask for extension 72350, and start dictating. When he has finished dictating, the stenographer at the other end politely asks his name, office number, and telephone extension number. And then she reminds him that his letters will be promptly sent to his office for his signature.

Patents

Indium Plating

U. S. Pat. 2,348,358. A. J. Phillips and A. A. Smith, Jr., assignors to American Smelting and Refining Co., May 9, 1944. The method of treating tin coated copper articles used for handling milk whereby small minute openings in the tin coating are sealed preventing milk from coming into contact with the copper base metal thereunderneath, which consists in plating indium on said tin coating to a thickness of 0.00003 inch, thereafter rubbing the indium coating with a soft cloth so as to spread the indium into surface imperfections in the tin coating filling them so that the copper base metal is provided with a sealing layer consisting of tin and indium which is free from pinholes and minute openings such as would expose the base metal.

Electroplated Receptacle

U. S. Pat. 3,348,549. G. K. P. Kraft (Sweden), May 9, 1944. A receptacle having an integral body and a handle of vitreous material for holding hot liquids, said body only being provided with an electrodeposited protective coating of copper while said body and handle are covered with an electrodeposited coating of at least one metal selected from the group consisting of nickel and chromium, at least the outermost of these layers forming a coherent continuous covering of metal for the outer surface of said body and handle; the absence of copper in the covering on the handle causing said handle to remain cool when a hot liquid is placed in said receptacle.

Rustproofing

U. S. Pat. 2,348,698. J. S. Thompson, assignor to Parker Rust Proof Co., May 9, 1944. In the chemical treatment of a metallic surface to form a corrosion-resistant paint-holding base thereon, the steps of moving a metallic surface in non-immersed condition past a roll having a yielding surface thereon, pressing the roll against the metallic surface during said moving, feeding an aqueous solution containing paint-base-forming chemicals between said roll surface and said metallic surface, adjusting the pressure of the roller against the metallic surface so that said solution is pressed into chemically reactive contact with said metallic surface and the desired amount of solution remains on said metallic surface and forming a paint-holding coating on the metallic surface from the chemicals so applied and their reaction products.

Plating Rack

U. S. Pat. 2,348,915. A. E. Lundbye assignor to The Crowell-Collier Publishing Co., May 16, 1944. An electroplating fixture for an apertured article including two electrically conducting separable plates, means for clamping the same to each other and on opposite sides of said article, insulating separators between the plates where the same are clamped together, anodes secured in one plate in electric contact therewith and positioned to pass through the apertures in the said article and extend into electrical insulators in the other plate, and insulators between the article and the plate carrying the anodes.

Electroplating Spark Plug Connectors

U. S. Pat. 2,348,919. T. W. Milton, assignor to The Flex-O-Tube Co., May 16, 1944. The method of making a radio shielded spark plug connector body which consists in molding a plastic body having ignition wire and spark plug branches, then electroplating said body, forming threads in the plastic body free end portions of said ignition wire and spark plug branches, threading fittings on said threaded branch ends of said plastic body with solder interposed between the fittings and the plating on said body, inwardly compressing the fittings at points over the solder, and completing the soldering by local applications of heat.

Degreaser

U. S. Pat. 2,349,000. W. D. Phillips and R. A. Van Fossen, assignors to John M. Bash, May 16, 1944. In a degreasing apparatus, a chest having a hollow upper rim adapted to act as a condenser, spaced inner walls within the chest below the hollow rim forming an inner vapor treating chamber and an outer condenser trap, a pair of vaporizing sumps mounted in the bottom of the treating chamber, a shed cover over the sumps to prevent dirty solvents from falling into the sumps while permitting vapors from the sumps to enter the treating chamber, a dirty solvent trap in the bottom of the treating chamber, means to deliver clean solvent from the condenser trap to one vaporizer, and means to deliver dirty solvent to the other vaporizer.

Degreaser

U. S. Pat. 2,349,001. W. D. Phillips and R. A. Van Fossen, May 16, 1944. In a degreasing apparatus, the combination of a vapor chamber, means to supply vaporized solvent within said chamber, vapor level control devices to establish a normal solvent vapor level in said chamber, and a radiant surface on the exterior of said vapor chamber above the normal solvent vapor level, said radiating surface being characterized by heat radiating properties greater than the heat radiating properties of other portions of the vapor chamber.

Anodizing Aluminum

U. S. Pat. 2,349,083. M. Farr, Jr., assignor to The B. & T. Floor Co., May 16, 1944. A process of producing on aluminum surfaces an electrolytic coating which comprises: making the aluminum to be coated an anode in an electrolyte containing about 10% by weight of sulphuric acid, surrounding the aluminum anode with an inner tank composed of a dielectric with said tank completely immersed in said electrolyte, supporting said inner tank within an outer tank comprising an electrical conductor in which the electrolyte is contained at a level above that of the inner tank, said outer tank forming the cathode connection of the electrolytic cell, applying to the electrolytic cell an electric current having a voltage of from six to twelve volts, maintaining the electrolyte at a temperature not in excess of 30° C., and continuing the application of said current for a period of approximately thirty minutes, said inner tank being located between the anode and the outer tank.

Wire Polishing Machine

U. S. Pat. 2,349,207. J. Stuart, II, assignor to Hercules Powder Co., May 16, 1944. A wire polishing device comprising a pair of stationary support members, means interconnecting said members and disposed in a plane including said members, a plurality of polishing elements secured to one of said support members, and a plurality of polishing elements secured to the other end of said support members in staggered and overlapped relation to the polishing elements on said first support member, whereby a wire passed between said polishing elements has exerted thereon a polishing pressure.

Deplating Rack

U. S. Pat. 2,349,356. R. R. LaMotte, assignor to International Harvester Co., May 23, 1944. A device for holding in an electrolytic deplating bath an article having an opening therein, by contact with and support of the article at the opening, comprising a metallic rod member having a threaded end, a shoulder near the threaded end, and a non-conducting coating covering the shoulder and a considerable portion of the rod on the side of the shoulder away from the threaded end, a first non-conducting member of annular form positioned on the rod in abutment with the shoulder, a lead member of annular form positioned on the rod in abutment with the first non-conducting member and having a peripheral surface adapted to engage the opening in the article to be deplated, and a second non-conducting member having threaded engagement with the threaded end of the rod and completely enclosing the same and abutting the lead member, the lead member being easily removable for replacement by virtue of the threaded engagement of the second non-conducting member.

Electroplating Cell

U. S. Pat. 2,349,662. T. J. Keating, assignor to Westinghouse Electric & Mfg. Co., May 23, 1944. In an electrolytic cell including an electrolyte, anode supports, and an anode suspended in the electrolyte, the anode depositing a sludge during operation of the cell, a metallic retainer surrounding the anode for catching the sludge comprising, in combination, a pan below the anode, a rim member about the anode extending through the surface of the electrolyte, suspension means electrically insulated from the anode supports for supporting the pan and rim from the anode supports, and a fine metallic screen attached to the edges of the pan and extending upwardly and attached to the portion of the rim member below the surface of the electrolyte, the metallic screen being of a fineness sufficient to function by itself to substantially prevent the passage of sludge therethrough, the pan, rim member, suspension means, and the screen being composed of metal inert to the electrolyte.

Wire Polishing Machine

U. S. Pat. 2,349,897. T. Wilson, assignor to Bethlehem Steel Co., May 30, 1944. In a polishing machine, a frame, spaced journal bearings for supporting the frame, means for rotating the frame, a pair of coacting dies mounted for radial movement in the frame, a swinging lever pivoted to the frame for actuating each dies adapted to throw the dies inwardly toward the axis of the frame into operative position by centrifugal force during the rotation of the frame and means for gearing one end of the swinging levers together.

Deplating Rack

U. S. Pat. 2,349,908. R. R. LaMotte, assignor to International Harvester Co., May 30, 1944. A holder for a circular metallic article adapted to have material removed therefrom upon immersion in an electrolytic bath, said holder comprising a metal support element having a tubular metal end portion, a spring-pressed plunger enclosed within the end portion, a metallic ring attached to the end portion and extending in a closed loop beyond the end of the end portion and in substantially the same plane therewith, a non-metallic article-holding tip carried on the plunger and projecting into the ring, the tip extending along a diametric line into the ring along the projected axis of the plunger, a metallic work-holding means carried by the ring at a location substantially diametrically opposed to the aforementioned tip, said ring being coated with a non-metallic coating, the latter article-holding means likewise being similarly coated but leaving a radially inward contact area uncovered to be engaged by the article, said spring plunger acting through its tip to clamp the article against the latter contact area and to automatically compensate for wear on the exposed area of said latter contact area.

Electroplating Reel

U. S. Pat. 2,349,946. F. Dürr (Germany), vested in the Alien Property Custodian, May 30, 1944. A reel comprising a first and a second disc-like end member having a common axis, said discs each provided with an outwardly extending axle portion, a first set of rods arranged about said axis and connecting said end members to each other, said first end member having a cylindrical circumference, said second end member having a stepped periphery providing a series of seats, a plurality of coaxial cage-like members each including a first and a second ring end and having a plurality of rods connecting said rings, the first rings of said cage-like members adapted to nest into each other and the innermost first ring fitting the circumference of said first end member, the second rings of said cage-like members successively nesting in the seats of said second end member whereby said cage-like members can be assembled to and disassembled from said end members by shifting in an axial direction.

Grinding and Polishing Machine

U. S. Pat. 2,349,964. L. L. Hercik, assignor to The Hill Acme Co., May 30, 1944. A machine including in combination, a driving pulley having a relatively large diameter, a contact pulley having a relatively small diameter, an endless abrasive belt mounted on said pulleys, the belt comprising two portions engaging the peripheries of the pulleys and maintained by the pulleys against vibration and two unsupported strands intermediate the periphery engaging portions, said unsupported strands being inherently subjected to vibration, the spacing of said pulleys being such that the length of each strand of unsupported belt does not exceed one and one half times the length of the periphery of the said contact pulley whereby the length of belt subject to vibration is kept relatively small, means for actuating the driving pulley, and a work support juxtaposed to said contact pulley.

Waste Pickle Disposal

U. S. Pat. 2,350,095. E. C. Carlson and D. F. Sharp, May 30, 1944. A method of neutralizing waste pickle liquor with a basic solution to render the liquor fit for disposal, said method being characterized by feeding separated flows of the liquor and the basic solution into the central intake of a centrifugal pump and there bringing them together while the pump is working so they are violently intermixed immediately upon their coming together, the mixture reacting without lumping or clotting and being forced by the pump through its discharge to create a smooth flow of a substantially neutral product fit for disposal.

Cadmium Plating

U. S. Pat. 2,350,165. J. A. Hendriks, Jr., assignor to The Udylite Corp., May 30, 1944. A method for the electrodeposition of bright cadmium comprising electrodepositing cadmium from a cadmium-cyanide plating solution containing a brown resin which is the thermal decomposition product of the condensation product of sulphamic acid and an aldehyde from the group consisting of croton aldehyde, aldol, paraldol and furfural and where the thermal decomposition is arrested before black appears in said thermal decomposition product.

Buffing Wheel

U. S. Pat. 2,350,216. G. R. Churchill, May 30, 1944. As a new article of manufacture, a buffing wheel comprising a closed ring of connected and radially extended fingers, each of said fingers comprising a plurality of layers of relatively narrow strips of cloth, each of said fingers having at least one radial edge impregnated with a buffing compound for substantially the length thereof and having the medial lengthwise portion of each finger unimpregnated throughout its length, whereby to facilitate absorption of fresh buffing compound in preparing said buffing wheel for use.

Vitreous Enamel

U. S. Pat. 2,351,252. A. J. Deyrup, assignor to E. I. duPont de Nemours & Co., June 13, 1944. A vitreous enamel composition suitable for use in enameling electrical resistors which comprises: lead oxide in amounts ranging from 45-65%; silica in amounts ranging from 4-15%; boric oxide in amounts ranging from 4-20%; alumina in amounts ranging from 3-9%; and ferric oxide in amounts ranging from 9-20%, said percentages being by weight based on the total weight of said vitreous enamel.

Sandblasting Machine

U. S. Pat. 2,351,272. R. G. LeTourneau, assignor to R. G. LeTourneau, Inc., June 13, 1944. In a sand blasting machine, a horizontally movable platform, drive means to move the platform through a predetermined path, said platform having a plurality of openings therethrough in spaced aligned relation lengthwise of said path, the platform being adapted to support a plurality of upstanding hollow members open at the lower end, and separately in register at said ends with the openings, a pair of sand blast nozzles, one disposed to discharge into the interior of one of said members through the corresponding opening and the other disposed to simultaneously discharge against the exterior of one of said members, control mechanism for the drive means arranged to effect step by step movement of the platform and a predetermined time lag between each step, said openings successively aligning with said one nozzle upon such movement of the platform, and means to rotate said members when each has moved to position for blasting by said other nozzle; said last named means including a driven spindle disposed below the platform in position to aline with said openings at each step, and means to elevate the spindle when the platform is stationary whereby said spindle projects through one of said openings, and engages and rotates the corresponding member.

Barrel Rolling Machine

U. S. Pat. 2,351,453. W. A. Pearl, assignor to Whiting Corp., June 13, 1944. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards, having sides and an end, a drum having an open end and a substantially closed end, extending longitudinally of, journaled to rotate in, and bodily movable with the frame, means for supporting the frame to swing on the structure on a transverse axis, disposed longitudinally between the ends of the drum so that the drum can be inclined downwardly for moving the castings along the drum toward its closed end, and its inclination varied for unloading, means for discharging water and an abrasive under pressure into the drum, the drum being provided with outlets for the water and sand, a shell around the drum supported by and movable with the frame, and provided adjacent the closed end of the drum with a discharge opening, mechanism for driving the drum, and a door for closing the open end of the drum.

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

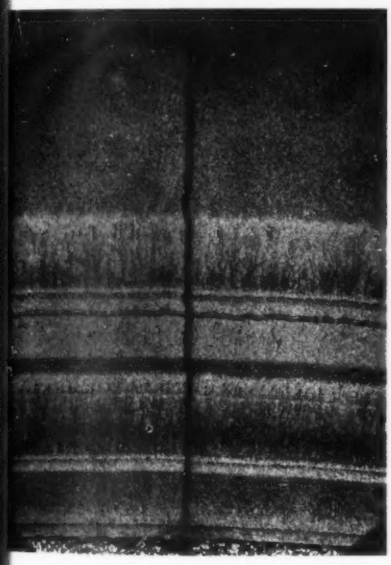
METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Removing Pit Holes

Question: I would like to get some information about polishing copper plate on stainless steel to get the pit holes out. I will appreciate it if you will send me this information.

A. W. C.

Answer: It is suggested that you obtain from your polishing compound supplier a buffing compound with a heavy cut. Some pits will be covered by flow of the copper, but deep ones can only be removed by removal of metal down to the base of the pit.



We regularly receive inquiries from subscribers as to the thickness of deposit required to entirely eliminate porosity. The photomicrograph, which is reproduced above, with the kind permission of George B. Hogaboom, shows a pit carried through a nickel deposit *sixty thousandths* of an inch thick.

The Editors.

Removing Iron

Question: Our chemist says there is iron in my chrome solution. Do you know of any way to remove same?

L. C. P. W.

Answer: According to N. A. Tope, iron may be removed successfully by plating with a mercury cathode. Unfortunately, chromium is co-deposited with the iron and rapidly forms a stiff chromium amalgam, which appears as a crust on the mercury cathode. This crust must be removed from time to time so that the plating process may continue.

Although ultimately the iron may be plated out by this method, the method is not considered sufficiently economical to apply to the large-scale purification of the solutions.

Rust Spots

Question: We have a large amount of silver plated flatware to refinish and also a number of mess trays to be tin plated. The flatware is of new merchandise and after being used once, rust spots break out on the sides and almost all over. We have refinished a number of these by pickling off the rust spots, then copper plating them and silver plate over the copper. However, they still break out with rust. Is the metal too porous? It appears to be black iron sheet and I thought maybe the plating would not throw into the pores.

The mess trays are black iron sheets which we have been tin plating one thousandth of an inch but they fail to hold up. Rust spots break out all over. Please advise if there is any other method or solution to coat this material to prevent the rust.

R. A. P.

Answer: Since the rusting of the original flatware has resulted in pores or cavities in the basis metal, we do not believe that it would be possible to refinish this material in such a way as to make it rustproof by silver plating only.

If you apply a sufficiently thick deposit and polish it so that the pores are closed over, you may get satisfactory results.

In connection with your mess trays, you might find that flowing of the tin by immersion in hot tallow maintained at a temperature above the melting point of tin may be of help in preventing rust.

Determining Acidity

Question: Can you furnish us with any information on the use of the pH meter in checking sulphuric acid anodizing solutions?

We know that this instrument is being used in checking chromic acid type solutions. However, we are unable to locate any information concerning this method of checking sulphuric acid electrolyte.

Any information you can give us on this subject will be greatly appreciated.

M. S. M. C.

Answer: Since the acidity of the sulphuric acid anodizing solution is quite high, pH meters are not suitable.

A simple method for determining acidity is to titrate with a standard sodium hydroxide solution using phenolphthalein. The procedure will be similar to that mentioned by Hartford in *Metal Finishing*, *42*, 72-3 (1944).

Tarnish Remover

Question: Could you recommend us a tarnish remover for silverplated mouthpieces which are used on brass musical instruments?

We do not like to use the cyanide dip because of its poisonous effects. We would prefer a cold solution to remove the tarnish.

Enclosed you will find a sample mouthpiece.

V. B. Corp.

Answer: We do not know of any satisfactory solution for this purpose which will operate at room temperature aside from cyanide.

However, a very satisfactory procedure is to immerse the parts in contact with a few pieces of scrap aluminum or zinc in a warm or hot solution containing 2 oz. per gal. of soda ash.

Iron Plating

Question: We are very much interested in iron plating and would appreciate any information you could give us. We would like to use cold solution if possible.

Questions:

1. Would the Ferrous Ammonium Sulfate Solution room temperature give us ¼" thickness or more on wax within forty-eight hours plating time?
2. Could this type of plate be case hardened or Chrome plated or both?
3. What metals can be Iron plated direct?

G. T. M. C. C.

Answers: 1. The Ferrous Ammonium Sulfate Solution at room temperature is not satisfactory for heavy deposits as such deposits are brittle and tend to curl away from the wax base.

2. Electrodeposited iron can be case hardened, chromium plated, or treated as any other form of iron.

3. Most metals except the corrodable ones like zinc, can be iron plated directly.

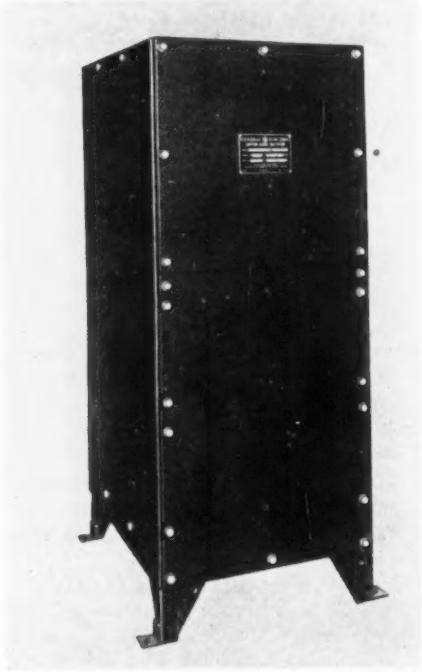
Whether the deposit will be satisfactory on certain metals will depend on the requirements.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Plating Rectifier

A new 6-volts, 2000-amp. plating rectifier for large installations, called the G-E "2000" has been added to the 300-amp. and 500-amp. rectifiers already in the G-E plating rectifier line, it was announced by General Electric's



Appliance and Merchandise Department in Bridgeport, Conn. This new rectifier, with four times the capacity of the 500-amp. rectifier, can be used with greater economy in large installations than four of the smaller units connected together. It provides 12 kw output capacity in one rectifier unit. Complete automatic control of the anodizing power supply can be had with this rectifier as well as with the smaller units by using a G-E automatic voltage regulator.

Different output ratings are possible with this rectifier—6 volts, 2000 amperes or 12 volts, 1000 amperes; 24 volts, 500 amperes or 48 volts, 250 amperes. The G-E "2000" rectifier has two separate secondary circuits each feeding a separate bank of copper-oxide rectifier stacks which may be connected either in series or parallel on the d-c buses in the rear of the unit.

This rectifier is available in two a-c supply ratings: 230 volts and 440 volts, three phase, 60 cycles. Two or more rectifiers may be connected in series, parallel to provide practically any output voltage and current required for plating or anodizing. The G-E "2000" is designed for floor mounting with the air intake at the bottom and exhaust at the top.

Walrus Leather for Metal Finishing

War-time conditions have made it difficult to obtain walrus hides and to tan them thoroughly for polishing metal surfaces. Metal finishers will be interested to learn that these difficulties have now been overcome by an approved process. This method of tanning produces especially long-wearing, tough, flexible leather for polishing wheels or bobs. The close, firm grain of this specially tanned leather results in a more lustrous and durable mirror finish than can be obtained by any other material. This walrus leather is furnished in any thickness from ½" to 1¼" for any size wheel or bob, by Greene, Tweed & Co., Dept. MF, 4377 Bronx Boulevard, New York 66, N. Y.

Water Cooler

Announcement of Strata-Flo water coolers designed to eliminate warm-up and "wet" systems (water in refrigerant lines), and featuring a simplified method of control, is made by Drayer & Hanson, Inc., Dept. MF, manufacturers of heat exchange equipment.

738 East Pico Street, Los Angeles 21, California.

While based on proven cooling principles, Strata-Flo Coolers are entirely new in design. The shell of the storage tank "A" is between vertical interior fins "B" and external refrigerant coil "C". Continuous cooling action on the entire body of water in the storage tank is transmitted from the refrigerant coil through the shell to these fins.

Professional Directory

$10,000 SAVED

HELP WANTED!

Here's one "help wanted" problem that's easily solved . . . even in these days of man-power shortages. If it's a problem in metal cleaning and working . . . the Diversey D-Man is always on deck to lend a helping hand. Backed by a Research Laboratory that has spent 18 years developing special purpose products, the Diversey D-Man can often show you ways to step-up production that require less manpower.

DIVERSEY D-MAN

With plenty of polishing compound to remove, cleaning of finished gears for airplanes can be a costly, tedious operation. For example, one plant, using a soap base material as an emulsifiable solvent, found that they had to run their gears through the automatic washing machine 3 to 4 times to get them clean. After switching to Diversey D-C No. 16, a single run through the machine completely removed all polishing compound. Cleaning costs were cut in half . . . a net yearly saving of about $10,000 . . . while output was stepped up three-fold.

Diversey D-C No. 16 is a triple duty product, used . . .

1. *As a solvent* for removing oily and greasy contaminations containing solids such as buffing and polishing compounds, drawing compounds, smut, dirt.
2. *As a water emulsion* for use in automatic washing machines handling iron and steel parts where rust inhibition is necessary.
3. *As a light-duty rust-proofing compound* between fabricating operations . . . eliminates need of heavy films.

D-C No. 16 is safe, non-toxic, non-inflammable at ordinary temperatures, practically odorless, non-corrosive and easy to remove. As a solvent, it combines effective solvent action with wetting and emulsifying power. As an emulsion, D-C No. 16 produces a stable, creamy white emulsion when poured into water. Non-foaming, it is an excellent cleaner for use in spray type washers. When used for rust-proofing, it leaves a light, clean film that does not gum or dirty inspection gauges. For liberal experimental sample, write Metal Industries Department.

THE DIVERSEY CORPORATION
53 W. Jackson Blvd., Chicago 4, Ill.

Steel Grip Safeguard

For punch press operators, employees handling sharp, jagged small castings, stampings, etc., the standard thumb and two finger guard of chrome leather has now been reinforced with steel ribbons. Placed vertically and staggered, this type of reinforcement gives excellent protection to the operator against cuts and abrasions and at the same time adds greatly to the handguard's wear and service.

The protector is steel stitched throughout and held firmly in position by quick-adjustable strap at the wrist.

More information concerning the safeguard and its uses may be had by communicating with the manufacturer — Industrial Gloves Company, Dept. MF, Danville, Illinois.

Wide Choice in Rectifiers

W. Green Electric, Dept. MF, 131 Cedar St., New York, N. Y., manufacturers of Selectro-Platers and other types of rectifier equipments, have recently issued to their representatives a new, comprehensive list giving details of several hundred models of their most popular Selectro-Plater and Dual-Plater units for electroplating and anodizing.

The list provides a choice of standard basic and remote control types, in voltages ranging from 6 to 120 volts, and in current capacities from 6 to 5,000 amperes in a single unit. For the first time, rectifier units are now available in multiples of 8 volts as well as the traditional 6 volts.

For laboratory and pilot plant use there are a number of models for operation from single phase supply. These are usually built for 115 volts or 230 volts, 60 cycles, but are available also for any special voltage, 25 or 50 cycle supply.

Larger units are listed for three-phase 60 cycle supply, any specified voltage, but since all Green Electric equipment is custom-built, can also be provided to match any power supply including three-phase, 25 cycle or 50 cycle, as well as two-phase 3-wire or 4-wire.

Apart from the units detailed in the list, Green Electric are continuing their policy of individual engineering, and are prepared to design and build rectifiers for intermediate current capacities, or to incorporate any special features nominated by the customer.

Although originally intended for electroplating and anodizing use, modified designs or entirely new types are supplied for such diverse applications as Magnaflux testing, welding, dynamic braking of large motors, industrial battery charging, high current testing, and a number of confidential war uses.

Tube rectifiers are used to supply voltages beyond those economically available from selenium rectifiers. Recent Green Electric tube equipments include units delivering maximum voltages of 500, 3,000 and 10,000 volts.

Continuous pickling of steel strip which is later to be formed into rims for automobiles and bicycles. Hooks shown are made of Monel flat bar and rod by Youngstown Welding & Engineering Co., Youngstown, Ohio.

Pickling hooks that take the bumps and jolts

Continuous pickler? Well, not quite . . . not until Monel hooks were installed.

For the previous hooks became so embrittled after a short period of service that they snapped off, and pickling operations stopped . . . all too often.

In order to reduce maintenance costs and excessive downtime, hooks of welded Monel flat bar and rod were employed for handling the steel strip.

Monel not only resists the corrosive action of hot sulfuric . . . it has *additional* qualities which make it especially suitable for this use.

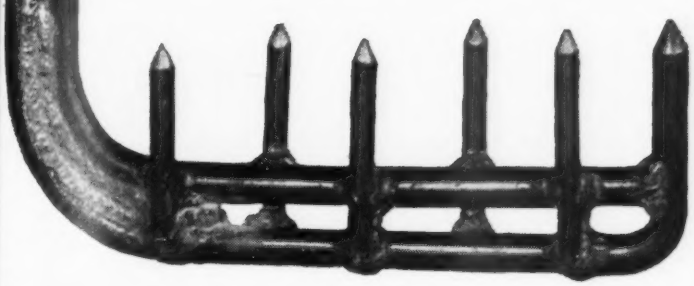
Most important are its high strength and toughness . . . two extra qualities that enable Monel to withstand the frequent bumps and jolts that fracture less ductile metals.

Then, too, standard mill forms are readily used . . . even for equipment that must be designed to meet specific needs. Whatever its form, Monel is easily fabricated and welded . . . retains its properties *after* welding.

Whether you use hooks or hangers . . . yokes or chains . . . baskets, crates or tie-rods . . . Monel can help you reduce downtime, cut pickling room maintenance expense or boost production.

For additional information regarding the use of Monel in pickling . . . or for assistance with your problems, call on

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK 5, N. Y.



Standard mill forms of Monel are readily fabricated and welded. This pickling hook measures 24¾" from top of plate to bottom of hook. Main part of the hook is ¾" diameter Monel rod.

INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL • Sheet...Strip...Rod...Tubing...Wire...Castings

"Looks" All-Plastic Goggles

New all-plastic goggles, "Looks," have been announced by Mine Safety Appliances Company. These goggles, featuring lightweight, wide vision and comfort, are suitable for both men and women, and provide comfortable, durable protection for the eyes, according to the company.

Designed with individual eye cups molded to fit the facial contours, the goggles provide a close yet comfortable seal around the eye orbits. Large "aviation-type" lenses afford a wide, unobstructed angle of vision.

The strong, clear plastic frame is available in two styles: the General Purpose Model, providing direct ventilation through holes at the top and bottom of the eye cups, and the Dust Model, with indirect ventilation through serrated lens seats. All lenses are of polished sheet acetate, clear or green in color, and are quickly and inexpensively replaced. A wide elastic headband holds the goggles in place at low tension, assuring wearing ease over long periods of time.

Further details on "Looks" goggles are available in Bulletin No. CE-25, copies of which are available from Mine Safety Appliances Company, Dept. MF, Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

Heavy Duty Polishing Lathe

A new polishing lathe for heavy duty work has been developed by the Jones Engineering Company. Known as the Jones Heavy Duty Polishing Lathe No. 143, the unit is designed

for bench or stand mounting. The lathe is a production machine and employs two Jones Contact Rolls equipped with fast-cutting, endless abrasive belts.

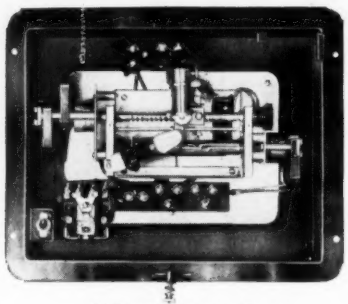
The No. 143 Lathe is built for two 14"-diameter, 3"-face contact rolls; has a 1-11/16"-diameter shaft and is 34" overall length. Spacing between the inside faces of the wheels is 24"; with 9" from the base to the center of the shaft. Longer shafts are available at a slight additional cost. The unit is equipped with a 3-groove V-belt motor shaft, and is used with a 2, 3 or 5-h.p. motor. The motor mounts underneath the bench or stand where it is free from dust and dirt.

The Jones Heavy Duty Polishing Lathe No. 143 gives a faster, better, easier and more uniform grind on all heavy duty work, according to the manufacturer.

Full details are available by writing to Jones Engineering Co., Dept. MF, Ellwood City, Pa.

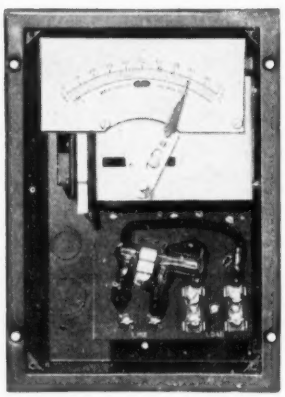
Industrial Controllers

Addition of three new instruments to its line of industrial controllers, and refinements in a fourth, has been announced by Wheelco Instruments Company, Dept MF, Chicago 7, Illinois.



Wheelco Inputrol

Two of the new instruments, designated Inputrols, are designed to control input of power, heat or flow of liquids or gases to any process equipment. The third, a Throttltrol, is designed to correct variations in heat requirements of furnaces and process equipment by positioning a valve in the fuel line.

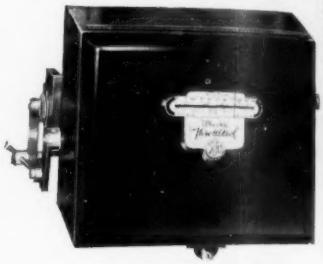


Wheelco Rheotrol

The company's Rheotrol, a manually operated controller for regulating input to electrically operated furnaces, ovens, heaters, kilns, etc., has been refined and is now offered in a flush-mounted case.

Inputrols are offered in automatic and manually set models. The basic elements of the instruments are a mercury switch mounted on a carriage, a rotating horizontal cylindrical cam driven by a small synchronous motor, and a spiral on which the mercury switch carriage is mounted. In the automatic model, which is used with a pyrometer, the spiral is turned automatically to posit the mercury switch carriage at the pro point along the rotating cam. In the man model, the spiral is set by hand to the in point desired by the equipment operator.

The Inputrol scale is illuminated and terms of percent of maximum input. I pointer is at 60, for example, the inst ment's mercury switch will be in its "O position 60 percent of the time, or 36 secon of each minute. Inputrols may be flush surface mounted.



Wheelco Throttltrol

The Throttltrol is essentially a simpli valve-positioning device designed for with any control instrument having a hi and low contact. It corrects variations heat requirements due to changes in lo control settings, air and fuel pressure, BT values and combustion efficiency. At a gi setting, it will permit a fuel valve to op only the desired distance when the t position control instrument is in its "O position. In this manner, it permits a m even and constant flow of fuel to the burn and minimizes the danger of "overshooting that is apparent in two-position controll when the fuel supply is either full on entirely off.

The Rheotrol is now offered in a new flus mounted case. The instrument provid stepless, wasteless control of current supp It replaces the standard rheostat and, eliminating the current waste through res tors, provides improved operating efficienc It places any temperature in the equipment range at the command of the operator.

New Alkali Steel Cleaner

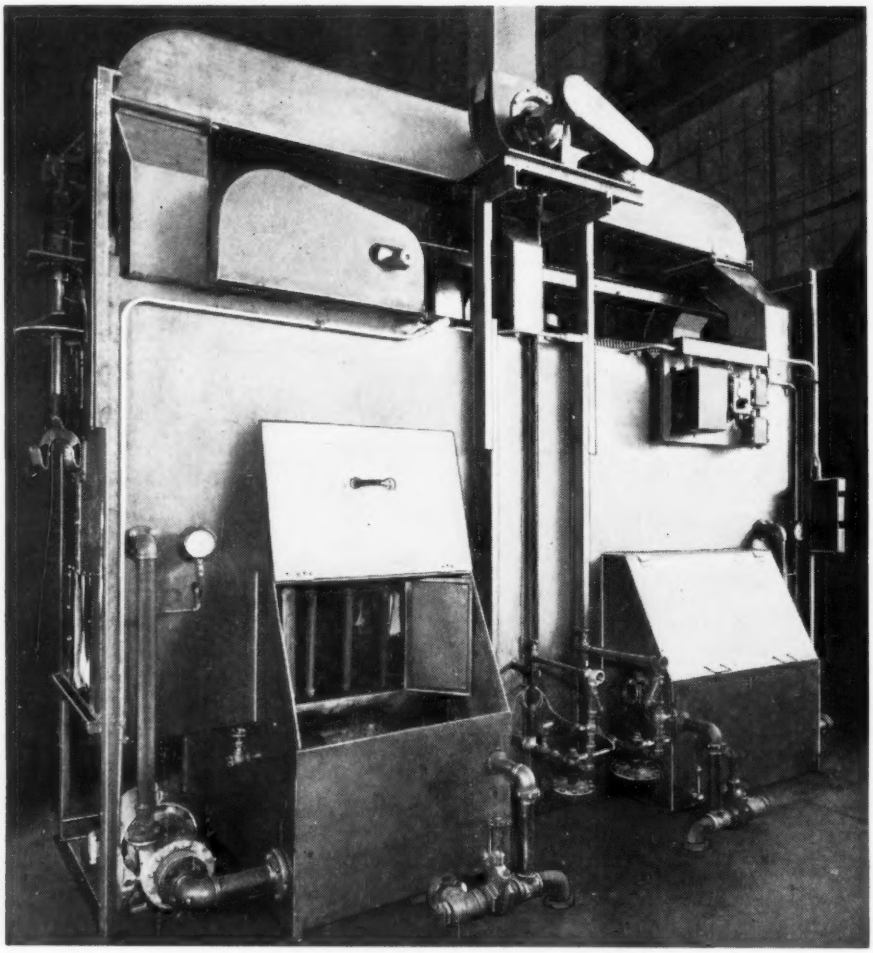
The Enthone Company, Dept. MF, 4 Elm St., New Haven, Conn., has announc the development of a new alkali material f cleaning of steel called Cleaner 100.

This product is used in a concentrati from 4-8 oz./gal. in the temperature rang from 180-212°F. It is stated to have ver high detergency and was designed for clean ing of steel. It is best used anodically but it is also claimed to be a very effectiv immersion cleaner.

Advantages claimed for the product in clude excellent rinsability, very long li due to buffering and selection of surfac active materials.

Cleaner 100 contains no soap such a rosin soap, but contains complex phosphate to solubilize any fatty acid soap that ma form from greases and oils being cleaned The cleaner is effective in soft and very hard water and does not form insoluble residues due to reaction with acids.

A bulletin is available describing th features of Cleaner 100.



New Monorail-Spray Metal Washer

A new and improved design in metal washing equipment, the Monorail-Spray Washer, has been developed by the Metal Washing Machine Division of American Foundry Equipment Company, Dept. MF, 555 Byrkit Street, Mishawaka, Indiana. The unit is designed to handle metal parts which must be rotated while they are passing through the cleaning chamber for highest cleaning efficiency. Typical work of this type includes intricate circular parts or those with many ports, crevices or openings.

A monorail conveyor is provided to carry the work through the path of well-positioned power sprays. Parts are suspended from hooks and can be rotated while passing through the cleaning stages.

Accessibility of all working parts is an important feature of the new design. The high pressure pumps and controls are easily serviced. Large access doors are provided to enable the removal of the spray system when periodic cleaning is necessary.

Although the standard Monorail-Spray Washer is designed primarily for washing and rinsing operations, it is so constructed that additional units like drying and rust-proofing sections may easily be added to the machine to suit variations in production setups.

The unit can be equipped for heating with steam, gas coils or electric immersion heaters. Thermostatic controls are furnished. To carry away steam and vapors, a well proportioned ventilation ductwork is provided on the top of unit.

The new Monorail-Spray Washer is briefly described in Bulletin No. 9 which may be obtained by writing directly to the company.

Industrial Aprons

Industrial Apron 48W is an all purpose product made from a good grade of fabric thoroughly impregnated and coated with a synthetic resin. This apron is characterized by its ability to resist acids, alkalies, oils and greases, electroplating solutions and cleaners, chemicals and corrosives of all kinds. It is double-coated on the front side and has a skim-coat on the back.

Industrial Apron 48W is made with tape sewn on the top two corners and with grommets on the sides so that it can be drawn tightly to the body of the wearer. It is stitched neatly around the edges and is made in the standard size 34½ inches wide by 44 inches long.

In addition to its chemical resistivity, Industrial Apron 48W has the advantages of being light in weight, strong and durable, and capable of withstanding abrasion.

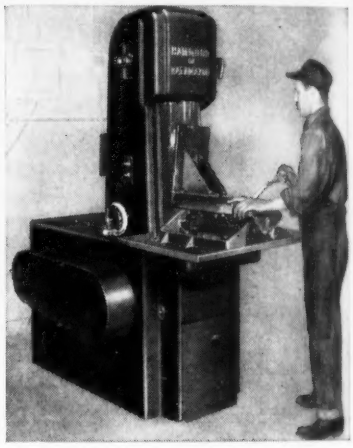
Further information may be obtained by writing to The Markay Industrial Products Company, Dept. MF, 2137 Stabler Road, Akron 13, Ohio.

Abrasive Belt Grinder

A new 10″ wet-n-dri Abrasive Belt Grinder has just been announced by Hammond Machinery Builders, Inc., Dept. MF, 1601 Douglas Ave., Kalamazoo 54, Michigan.

This new 10″ wet-n-dri grinder carries up to a 10″ abrasive belt and weighs over a ton. It is said that any material that can be ground can be surfaced or finished on the Hammond Model V-10. It is claimed that many jobs now being done on shapers, milling machines, surface grinders, disc grinders, etc., can be finished faster and better on this new grinder. Operations such as deburring, descaling, chamfering, beveling, and the finishing of pads, bosses, and thin sections of castings forgings, stampings, etc., are easily within the range of work possible on this new 10″ grinder.

The abrasive belt can operate to the edge of the belt backing-plate where clearance is provided for getting into corners. The machine will accommodate various types of tables and the number of special work holding fixtures to hold work of various shapes and sizes is unlimited. The machine is now



equipped as standard with either of two types of tables, oscillating or plain, determined by the class of work being handled. The oscillating table has a micrometer stop graduated in .001″ for accurately controlling depth of grind, and has three "T" slots for attaching fixtures. It has a single handle for both feeding and oscillating the work. Oscillation permits faster cutting and provides uniform wear on belt and belt-backing plate, it is claimed.

The idler pulley is mounted on a heavy column which incorporates a built-in automatic belt tensioning device (patent applied for). It is claimed this exclusive Hammond feature insures automatic taking up of belt stretch and provides vibrationless operation. It is said that accuracy within reasonably close tolerances can be depended upon in large volume production.

Large capacity coolant tank unit is located in the base of the machine and adequate controls are provided for wet grinding operations. Coolant flow controls are located outside the machine within easy reach of the operator.

For dry operation coolant unit is omitted and connection for exhaust provided.

Metallizing Gun

Metallizing Engineering Co., Inc., announces the introduction of the Metco Type 3E metallizing gun—specially engineered for the high speed production spraying of low melting point metals. Using ⅛ inch zinc, tin, lead, solder, babbitt, cadmium, or fine gage copper and copper alloys, this new gun exhibits spraying speeds which exceed by far any yet attained with these metals. Rates

of deposition, in pounds per hour, include: zinc—40, tin—70, lead—110, solder—90, babbitt—75.

Regardless of the type of wire employed, no gear changes whatsoever are necessary to achieve these extraordinary high speeds. *Any* spraying speed within the prescribed ranges is automatically obtained, and maintained hour after hour, by the patented Controlled Power Unit—an integral part of the gun. Air pressure fluctuations do not affect its operating efficiency.

In common with all Metco metallizing guns, the Type 3E is equipped with a Universal Gas Head, which allows the tool to be operated on any commercial gas—in conjunction with oxygen and compressed air. A Duplex Mounting Fixture is provided for permanent installation on the production set-up.

Owners of Metco Type E or 2E guns may have their present equipment quickly converted to a Type 3E. Or, should the demand arise at a later date, the Type 3E may then be converted back to the standard Type E or 2E.

Full particulars obtainable by writing to Metallizing Engineering Co., Inc., Dept. MF, 38-14 30th Street, Long Island City 1, N. Y. —by writing for Bulletin 46.

Bright Alloy Plating Process

Announcement is made of the new HVWM Bright Alloy Plating Process. This process was developed in the laboratories of the Westinghouse Electric and Mfg. Co. and has been used with great success as a protective coating on many important electrical products. The coating consists of an alloy of copper, tin and zinc. Patents covering this process are now pending.

The anode area should be 85 per cent insoluble and 15 per cent soluble. Ball anodes are used with steel containers and for the

balance of the insoluble anode area steel is preferable to carbon.

The alloy deposit is readily soldered using rosin as a flux. Alloy-coated parts can be soldered more readily than tin-coated parts which have become oxidized due to storage or exposure.

The outstanding property of this bright alloy coating is its corrosion protective value when applied over copper or brass. It is possible for a thickness of .0002" to withstand a 200 hour salt spray test, and even after 200 hours little or no corrosion product is formed on the surface. In actual tests on radio frequency instruments, it has been found that .002" of the bright alloy deposit gives as much protection as .005" of nickel.

The alloy is relatively brittle in heavy coatings; however, it is seldom used in thicknesses over .005". It is harder than nickel and its wear resistance is superior to normal nickel deposits.

When a mirror-like surface is required, the alloy deposit can be colored more readily than nickel and its reflectivity approaches that of silver. It is not recommended for application directly on steel where the prime requisite is corrosion protection. A copper undercoating should be applied to obtain the full benefit of the low corrosion rate between copper and the alloy deposit.

The equipment required is similar to that used for copper plating. Unlined steel tanks are satisfactory. Steel coils are used for heating the solution to the proper temperature which, for still plating, is 140°-150° F. and for barrel plating is 150°-160° F. When more than one tank is operated from a generator on a 6 volt line, a 2 volt drop rheostat is used. Usually the rheostat should be based on a cathode current density of 15-20 amp. per sq. ft. of surface area.

The Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J., is the sole agent for marketing and servicing the process.

Zinc Bright Dip

The Chemical Corporation, Dept. MF, 93 Broad Street, Springfield 5, Massachusetts, has announced the development of "Luster-on," a new inhibited zinc bright dip for producing chromium brilliancy on dull zinc surfaces.

It is claimed by the manufacturer that "Luster-on" gives brightening action to electrodeposited zinc surfaces obtained from either cyanide or acid-type plating baths and can also be used as a dip for zinc-base die castings provided the alloying aluminum is very low. Hot dip galvanized zinc surfaces cannot be brightened.

Use of "Luster-on" dip is not to be compared to a buffed surface; however, it can be safely and satisfactorily employed to obtain bright zinc, and it eliminates the necessity of a buffing operation. Any operator familiar with acid dips for plating can quickly and satisfactorily use this bright dip. Zinc plated parts can be processed either on racks or in baskets.

The company has published a folder on the process which will be furnished on request.

Atomizing Nozzles

For chemical processes involving the spraying of acids or other corrosive liquids, there are now available atomizing nozzles made entirely of hard rubber.

These nozzles produce a hollow cone type of spray effecting uniform distribution of the liquid being sprayed. A variety of sizes provides a practical range of capacities and spray angles which permit exercising of close control over the spraying operation.

Further information on this, as well as other spray nozzles for various process applications, may be obtained by writing to the manufacturer, Spraying Systems Co., Dept. MF, 4039 West Lake Street, Chicago 24, Ill.

New Book

Journal of the Electrodepositors' Technical Society. Published by the *Electrodepositors' Technical Society*, Northampton Polytechnic Institute, London, E.C. 1. Volume XVIII. 1942-3. 149 pp. plus index. Price: 1 Guinea. Owing to the dearth of papers submitted during the last two sessions, the papers of both sessions are combined in this volume. The subjects cover a wide range of the art and among the most outstanding papers are those dealing with hard chromium plating of ordnance, zinc plating from sodium zincate solutions and the determination of deposit thickness by specific gravity. The information which may be obtained by chromium platers in the article by Dr. D. D. Howat alone would put this volume on the recommended list.

ANNOTATED BIBLIOGRAPHY OF ALUMINUM CLEANING

(Concluded from page 479)

(200) Cleaner, Metal Silicate-Soap, Navy Aeronautical Specification C-109a, March 31, 1942.

Tests include: Surface properties, solubility, cleaning properties (against mineral oil on an aluminum panel), rinsing properties, and corrosiveness.

(201) Compound, Carbon Removal for Aircraft Engine Parts (Cresol Type), Navy Aeronautical Specification C-86b, June 24, 1942.

Corrosion test for anodized aluminum alloy, polished aluminum alloy, polished copper, and steel strips. An enamel and varnish stripping test is outlined, as is a test for evaluating the removal of S.A.E. No. 50 oil. A test for rinsability is included.

(202) Compound, Carbon Removal, for Aircraft Engine Parts, Navy Aeronautical Specification C-118, May 16, 1942.

Tests include corrosiveness, carbon removal from a heavily carbonized aluminum alloy piston, oil removal properties (S.A.E. No. 50 oil), and rinsing properties.

(203) Compound, Carbon Removal (for Engine Parts), Army Air Force Specification No. 20025, June 15, 1942.

Carbon removal test from a portion of a carbon-covered aircraft engine piston, and a corrosion test.

(204) Compound, Engine Cleaning and Paint Stripping, Navy Aeronautical Specification C-114, Amendment 1, March 10, 1942.

Tests include corrosiveness, stripping properties, rinsing properties, oil removal (S.A.E. No. 50 oil), and carbon removal from a carbonized aluminum piston.

(205) Compound, Grease-Cleaning, Solvent-Emulsion-Type, Federal Specification P-C-576, November 6, 1942.

Includes stability and kerosene and water solubility tests. Aluminum panels are treated with an S.A.E. No. 70 lubricating oil to which sufficient talcum powder is added to form a paste. The panels are then baked at a temperature of 290 to 300° F. for 3 hr., cooled, then cleaned under standard conditions.

(206) Metal Conditioner, Acid, Concentrated, Tank-Automotive Center, Tentative Specification HQMB ES-No. 431b, August 7, 1942.

Includes tests for sedimentation, flash point, and etching action.

(207) Cleaner, Carburetor, Tank-Automotive Center, Tentative Specification TAC ES-No. 645a, March 17, 1943.

Includes corrosion, solubility, emulsification, and homogeneity tests.

(208) Compound, Vapor Cleaning, Tank-Automotive Center, Tentative Specification TAC ES-No. 542b, May 1, 1943.

Includes tests for insoluble matter, solubility, solution stability, stability at 75° C., water softening ability, surface tension, hydrogen-ion concentration, and rinsing properties.

(209) Corrosion Prevention, Processing and Packaging, Ordnance Department Tentative Specification TM 38-305, August 1, 1943.

A 60-page specification which includes instructions for solvent cleaning by immersion, spray vapor degreasing, and removal of perspiration and similar residues. Alkaline cleaning specifications include immersion cleaning using formulas exemplified by the following:

I

85 per cent Sodium orthosilicate
10 per cent Sodium carbonate (anhydrous)
5 per cent Sodium resinate

II

46 per cent Sodium carbonate (anhydrous)
32 per cent Trisodium phosphate
16 per cent Sodium hydroxide
6 per cent Rosin

Alkaline spray cleaning can be done with single compounds such as:

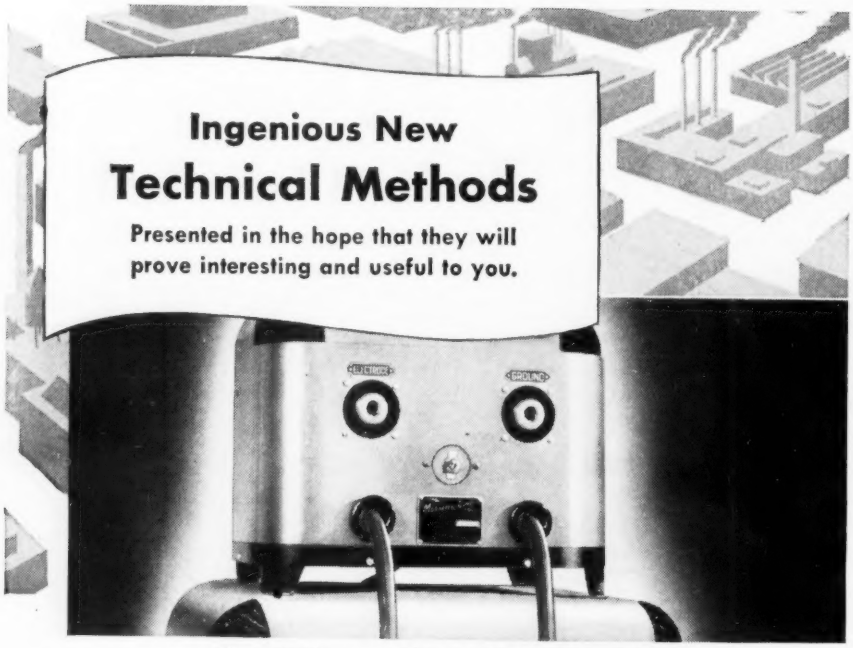
Sodium orthosilicate,
Sodium metasilicate,
Tetrasodium pyrophosphate, and
Trisodium phosphate.

Alkaline electrocleaning can be carried out using formulations I or II above, for alkaline immersion cleaning.

Emulsion spray cleaning and emulsifiable solvent soak cleaning methods and precautions are described.

Directions include sections on general directions, materials and control conditions, control and operation of rinses, and procedure for cleaning.

Specific precautions are given regarding the cleaning of aluminum, magnesium, zinc, and their alloys by alkaline cleansers.



Revolutionary Hy-cycle Automatic Arc Provides Complete Control of Arc and Heat

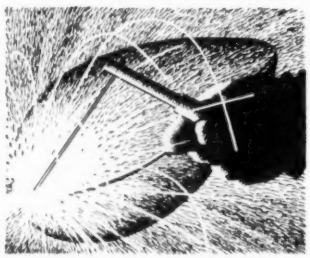
At last, a development that automatically starts the arc before the welding electrode actually comes in contact with the work! Eliminating the "pecking" or "scratching" that so often creates tension and operator fatigue. Its many advantages contribute largely to saving time and labor because an operator can be trained in far less time than usual, and higher speeds can be obtained. This hy-cycle automatic arc unit, called "Missing Link," permits the operator to weld with any welding rod, bare steel or alloy. Rods that could not be used before can be burned with ease—such as bare mild steel, dust coated, reverse polarity, aluminum, bronze, stainless steel, etc., AC or DC.

One of its most important advantages is welding light gauge. Light gauge requires low heat—making many jobs almost impossible for ordinary methods. Since the "Missing Link" starts automatically on as low as one ampere of heat, the welding of light gauge sheet can be done with surprising speed with no time out for "pecking" and "sticking."

You all know that our fighting men need the finest quality materials that we here at home can produce. That goes for Wrigley's Spearmint Gum, too. Although our stock pile of quality raw materials is getting lower and lower we are maintaining our standards of quality. Naturally, we are forced to limit production. So we are giving priority where it is needed most—and where you want us to—our fighting men and women overseas only. Because chewing gum is essential to them—they are getting all of our limited production of Wrigley's Spearmint Gum.

You can get complete information from Mid-States Equipment Company, 2429 S. Michigan Ave., Chicago 16, Ill.

Simplifies welding vertical and overhead



Makes it easy to weld light gauge work

Y-133

Business Items

Dr. L. W. Eastwood, formerly vice-president of the Maryland Sanitary Manufacturing Co., has been named to the staff of *Battelle Institute*, Columbus, Ohio, where he is engaged in metallurgical research.

Dr. Eastwood is a graduate of the University of Wisconsin, from which he received Bachelor of Science, Master of Science, and Doctor of Philosophy degrees in metallurgy. He has had nearly fifteen years of research, teaching, and executive experience, serving as assistant professor of metallurgy at the Michigan College of Mining and Technology for four years and as a research metallurgist for the Aluminum Company of America for seven years. He became vice-president of the Maryland Sanitary Manufacturing Company in 1942.

A writer of technical publications on metallurgy, Dr. Eastwood is author of a book on metallography and has contributed to various publications of technical societies. He is affiliated with the American Institute of Mining and Metallurgical Engineers, the American Society for Metals, the American Foundrymen's Association, the British Institute of Metals, the British Iron and Steel Institute, Tau Beta Pi, honorary engineering society, and Sigma Xi, honorary scientific society.

F. T. Turner has been promoted to assis sales manager of the brush division of *Osborn Manufacturing Company*, Cleve Ohio, it is announced.

F. T. Turner

In his new duties Mr. Turner will organ sales planning for the division and will as *M. C. Pecsok*, sales manager, in supervis of the sales force for the world's largest dustrial brush manufacturer.

Mr. Turner, a graduate of Cornell U versity in Mechanical Engineering, j joined Osborn in 1932, being employed the Technical Department on design a application of power-driven brushes. For s eral years he represented the company in Pittsburgh area as sales and service engine He was recently in the home office on spe assignments.

Ted J. Wieczorek has been employed the *Chemical Corporation* to service the me finishing trade in Connecticut with respect chemicals and cleaning equipment for me finishing. He has had a very wide experie in all phases of this industry through many years of association with The Stan Works in New Britain. More recently served as Chief Chemist and Producti Manager for the Pape Electro-Plating Co pany in New Britain, Conn.

The *Pennsylvania Salt Manufactur Company* announces that it will open a d trict sales office at Cincinnati, Ohio, in Carew Building to serve the territory incl ing Southeastern Indiana, Southwest Ohio, and the major part of Kentucky.

Louis M. Kuilema, who has been appoint district sales manager in charge of t office, was formerly with the Paper Mak Chemical Department of the Hercules Po der Company and has been in the execut offices of that company in Wilmington, De ware, for the past seven years. Kuilema is native of Kalamazoo, Michigan, and attend Kalamazoo College and Western Michig College. Before his entrance into the che cal business, Kuilema had been associat with the U. S. Pressed Steel Products Co pany and the Kalamazoo Stove Company.

Wilfred S. McKeon, president of *Sulphur Products Company, Inc.*, of Greensburg, Pa., has announced the appointment of *Lawrence J. Durney*, of Philadelphia, as chief chemist

Lawrence J. Durney

of the company. Mr. Durney is a graduate of Manhattan College where he majored in chemistry and mathematics with a degree of Bachelor of Science.

For the past two years, Mr. Durney has been associated with Remington Rand, Inc., Propeller Division, Johnson City, N. Y., where he served as plant chemist and foreman of the plating department.

As chief chemist for Sulphur Products Company, Inc., his main responsibility will be the development of the application of McKeon's "Liquid Sulphur" as a copper stripping agent, also developing special cleaning agents.

John W. Cartoll has opened an office at 845 Law Building, Kansas City, Mo., and will represent in this territory the *Roberts Rouge Co.*, Stratford, Conn., manufacturers of buffing and polishing compositions.

Mr. Carroll's business experience has been broad, varied and successful and will prove most valuable in his new line of endeavor.

He was born in Dallas, Texas, and graduated from Austin College with the class of 1917. Later, he attended Washington University at St. Louis, Mo., and Columbia University, N. Y. He is married and has one son. In World War I, he served as 2nd Lieut., Field Artillery.

He had connections with Monsanto Chemical Co. of St. Louis for two years, and during the next five years was vice-president and treasurer of Thermos Chemical Co. of St. Louis. During the next seventeen years, he held responsible positions in Wall Street, New York, with two large investment banking firms, and later became associated with Pratt & Whitney Aircraft, East Hartford, Conn., and Kansas City, Mo.

During these years, he traveled extensively over the entire country and has many friends and business connections. Experience gained with Pratt & Whitney in the polishing and buffing line will make this new connection pleasant and successful.

Roberts Rouge Co. will have a warehouse in Kansas City, where a full line of all products manufactured will be maintained to more quickly service the large and rapidly expanding western business which this concern has enjoyed for some time.

H. O. Teeple, chemical engineer, has joined the Technical Service Group of the Development and Research Division of *The International Nickel Co., Inc.*, at New York. *T. H. Wickenden*, manager of the division, announces. He will specialize in corrosion problems.

After graduation from the University of Michigan in 1937, Mr. Teeple became associated with the alkali and chlorine products industry, remaining there until coming to International Nickel. He has had experience in production, process control, and maintenance engineering, including equipment specifications, corrosion control and the use of metals, alloys, plastics, and paints.

E. J. Zimmer, Jr., has just been appointed assistant to *L. B. Keplinger*, vice-president and director of sales for *Rheem Manufacturing Company*. Mr. Zimmer, in his new capacity, will concentrate on the development of sales for new post-war products to be made by Rheem which will include household utilities complementary to its current line of automatic water heaters, space heaters, boilers, pressure tanks and other items. The company also manufactures a full line of steel containers for the petroleum, food and beverage, paint and varnish, and chemical industries.

A graduate of Cornell University in 1926, Mr. Zimmer has been continuously associated with E. I. du Pont de Nemours & Company since that time. For the past few years he has been with Remington Arms Company.

The Cowles Detergent Company, Cleveland, Ohio, announces the appointment of *Charles W. Churchill* as Cowles Technical Engineer for Northeastern Ohio and Western Pennsylvania territory. Mr. Churchill

Charles W. Churchill

has a background of education and finishing experience which should be valuable to the many friends and customers of Cowles.

Clyde E. Lowe of Lakewood, Ohio, covers Cleveland and Northwestern Ohio. He was born in Cleveland and educated at Mount Union College. Mr. Lowe has a wide experi-

Clyde E. Lowe

ence in metal cleaning, wire drawing and wire coating which has fitted him well to handle the problems of the metal working plants in his territory.

Star Chromium Corp. announces that it is now located in new quarters at 43-44 37th St., Long Island City 1, N. Y.

Election of *Howard P. DeVilbiss* as president and general manager and of *Allen D. Gutchess* as chairman of the board and active senior executive of *The DeVilbiss Company*, Toledo, Ohio, was announced recently fol

ing a meeting of the Board of Directors. new president had served for several s as vice-president of the company, a ing producer of medicinal and perfume nizers, spray painting equipment, exhaust ems, air compressors, hose and connec- s. Gutchess has been president of the since 1929. As board chairman, he suc- d *W. M. Booker*, who will continue as a mber of the board.

Coincident with these changes, *Frank A.* ley, vice-president and general manager has been with the company for 34 years, tiring because of poor health. *Roy A.* er continues as vice-president in charge sales and becomes a director of the cern.

The company has also announced the ap- tment by Howard P. DeVilbiss of *Don J.* ps, of the engineering staff, as acting f engineer.

The DeVilbiss Board of Directors as now stituted is composed of *B. T. Batsch*, *M. Booker*, *Walter W. Conklin*, *Howard DeVilbiss*, *F. H. Gordon, Jr.*, *Allen D.* chess, *Roy A. Guyer* and *John T. Rohr.* With the election of Howard P. DeVilbiss, third man of that name heads the corpo- on. Son of the late *Thomas A. DeVilbiss*, sident during one of the corporation's atest periods of expansion, and grand- of Dr. Allen DeVilbiss, who founded business in 1888.

Mr. Guy Berghoff has been appointed tor of public relations of the Pittsburgh te Glass Company and *Mr. Bryan Eng-* d as assistant director, as of July 1, 1944, ording to an announcement by *Mr. H. B.* gins, president.

or the past 10 years, Mr. Berghoff has n assistant glass advertising manager. e recently, much of his time has been en to glass sales promotional work and to s-product publicity. Mr. England, who directed the company magazines, will tinue to edit these publications, and will st in publicity work.

The new organization is designed to avoid lapping of departmental activities, to g all publicity of whatever nature under direction, and to integrate more closely work of sales, advertising, publicity, and company magazines.

Mixing Equipment of Rochester, N. Y., nufacturer of Lightnin and Mixco Mixers, ounces the appointment of *Edgar A.* gers as exclusive representative in Georgia, abama and the major portion of Tennessee. Rogers received his technical education at University of Arizona and Cornell Uni- ity where he received the degree of hanical Engineer. He settled in the South tly after the close of World War I in ch he served as Lieutenant in the Air vice. Prior to United States entry in war he had served as pilot with the tch Air Forces.

Having been engaged in consulting and s work in the Chemical and Process Indus- s in this territory for many years, Rogers ys a wide acquaintance among manu- urers and engineers. He will make his dquarters in the Chattanooga Bank Bldg., ttanooga, Tenn.

Associations and Societies

THE ELECTROCHEMICAL SOCIETY

The Board of Directors of *The Electrochemical Society*, an international organization, announces the award of the eighth Edward Goodrich Acheson Medal and Thousand Dollar Prize to *Dr. William Blum*, Chief of the Section of Electrochemistry, U. S. Bureau of Standards.

Dr. William Blum

Dr. Blum is to a very large measure responsible for the standardization of electroplating methods and of plating formulas. He has been with the Bureau since 1909 and for a number of years he was closely associated with *Dr. W. F. Hillebrand*, former Chief Chemist of the Bureau.

The formal presentation of the Gold Medal and $1,000 Prize will take place at the fall convention of The Electrochemical Society at Buffalo, N. Y., October 13, 1944.

Past recipients of the Acheson award are: *Edward G. Acheson* (graphite and carborundum); *Edwin F. Northrup* (induction furnaces); *Colin G. Fink* (tungsten, chromium, tin); *Frank J. Tone* (silicon and silicon carbide); *Frederick M. Becket* (ferroalloys); *Francis C. Frary* (aluminum); and *Charles F. Burgess* (electrolytic iron, dry batteries).

A. E. S. CONFERENCE FILMS

The Annual Conference of the American Electroplaters' Society held at Cleveland June 12 to 14 inclusive has been filmed completely by one of the best commercial photographers in northern Ohio. This film is in 16 mm, capable of being projected on any standard projector such as Keystone, Bell & Howell, or Eastman, and is being offered for showing by its sponsors, *The Lea Mfg. Company*, 16 Cherry Avenue, Waterbury 86, Conn.

The Conference is completely filmed. Well known people from the entire industry were present at Cleveland and you will see their smiling faces beaming at you. Excellent shots were made of the Registration, Ladies' parties, Room parties, International Fellowship functions, Annual Banquet, and last but not least, the very excellent Floor Show which culminated the Banquet.

Any Branch of the Society or any other group of interested people may borrow the film by writing to The Lea Mfg. Co., Dept. MF, 16 Cherry Avenue, Waterbury 86, Conn.

It will be available for showing, comple titled, after September 1, 1944. The s sors state that it will be necessary to the film, of which there is only one cop the order in which requests are receive do not delay in writing for it."

AMERICAN CHEMICAL SOCIET

How the chemical industry has contrib to the war effort and its effect on the im diate post-war period will be emphasize the third *National Chemical Exposition National Industrial Chemical Conferenc* be held November 15 to 19 at the Coli in Chicago under the sponsorship of Chicago Section of the *American Chem Society*.

"Every telling blow rendered by armed forces against the enemy bring nearer the peace," said *M. H. Arveson*, c man of the exposition committee. "It widely known and accepted fact that chemical industry is taking a major in the war effort. It reaches into virt every industry and every product and credited with scientific advancements have contributed to the assured victory o Allies.

"The show and conference will have a significance, therefore, this year. It depict the science of chemistry in man its phases and its application to ind and the needs of mankind in peace as as wartime."

Mr. Arveson said that new discoveries products which have been developed du the war by the chemical industry will play an important part in providing luxu as well as the necessities of life for civ use.

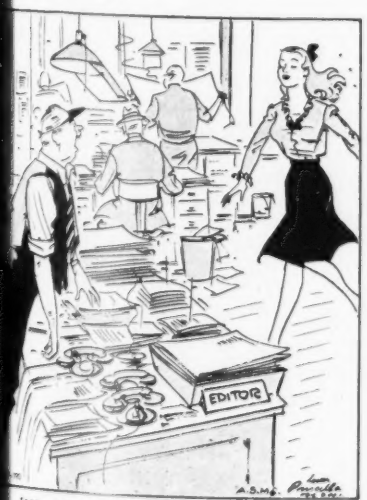
"Just at present we are facing the

of providing additional space to accomo- an almost overwhelming demand," said Arveson. "We are negotiating for the h Hall of the Coliseum which will yield dditional spaces if we can complete the ."

vitations have been sent to well-known horities on practically every phase of ied chemistry who have been asked to ress and lead discussions on important s at the National Industrial Chemical ference. The commodious second floor he Coliseum Annex will house the con- nce. It may be reached directly from exposition hall.

he show and conference advisory com- ee is composed of the following: *llen Abrams*, Vice-President, Marathon r Mills; *George Granger Brown*, Presi- , American Institute of Chemical Engi- s; *J. V. N. Dorr*, President, The Dorr mpany, Inc.; *Willard H. Dow*, President Chemical Company; *Gustav Egloff*, ctor of Research, Universal Oil Products ; *Otto Eisenschiml*, Manager, Scientific Compounding Co.; *Per K. Frolich*, Di- or of Chemical Division, Esso Labora- s, Standard Oil Development Co.; *Frank lin Jewett*, Chairman, Bell Telephone oratories, Inc.; *C. F. Kettering*, Vice- sident, General Motors Corporation; *S. D. patrick*, Editor, Chemical & Metallur- l Engineering; *C. S. Marvel*, President- , American Chemical Society; *C. E. K. s*, Vice-President in Charge of Research, stman Kodak Company; *Thomas Midgley*, President, American Chemical Society; *S. Miner*, Director, Miner Laboratories; *ter J. Murphy*, Editor, Industrial Engi- ring Chemistry; *R. C. Newton*, Vice- sident, Swift & Company; *Charles L. sons*, Secretary, American Chemical So- ; *Holman D. Pettibone*, President, Chi- o Association of Commerce; *Edgar M. ney*, Chairman of the Board, Monsanto mical Company; *N. A. Shepard*, Chemi- Director, American Cyanamid Company; *bert Taylor*, Editor, Chemical Industries; *R. Weidlein*, Director, Mellon Institute Industrial Research, and *Frank C. Whit- re*, Dean of School of Chemistry & Physics, nsylvania State College.

Marcus W. Hinson, Manager of the Expo- on, maintains headquarters at 330 South lls St., Chicago.



"COPY BOY! BOY! OH, BOY! BOY O-BOY O-BOY O-BOY!"

News from California
By FRED A. HERR

Rheem Mfg. Co., Los Angeles, currently one of the larger producers and finishers of shell casings, is also preparing for the post-war era when its huge lineup of tanks will no longer be needed for dip-finishing shell casings. The recent acquisition by the Rheem Co. of an interest in the *Platt-LePage Aircraft Co.*, helicopter builders, is regarded as indicative that the Rheem Co. probably will produce helicopter parts as one of its post-war activities.

In a move to expand its laboratory research to include a wider range of chemical processing and cleaning, *Kelite Products, Inc.*, Los Angeles, has advanced *Joseph H. Hart*, formerly chief chemist, to laboratory director and has increased the laboratory personnel.

Meredith H. Fairchild has been promoted to chief chemist, his former position as analytical chemist being filled by *Donald W. Vance*, who recently joined the Kelite organization.

Mr. Hart, a member of the Los Angeles section of *American Chemical Society*, has been with Kelite since shortly after its establishment, and previously was testing engineer with the Bureau of Standards. He has been

Joseph H. Hart

an active leader in the application of pH control to chemical cleaning and processing.

Mr. Fairchild, who joined Kelite in 1942, is a graduate of Northwestern University. Mr. Vance received his degree from Leland Stanford University. Both have done post graduate work at University of Southern California.

Salvaging worn out machine tools & machinery parts by metallizing is being complished in considerable volume at *Douglas Aircraft Co.'s* Southern Calif plants.

The company uses a technique of spra the molten metal on the worn surfaces then machining to original diameters. use of this method, it is reported, has s hundreds of machine tools, many of wh are now difficult to replace, from the dis

Because the present rate of aircraft p duction made it necessary to keep tools machinery in use on 24-hour schedules, quent breakdowns were reported to h occurred. Since it was impossible to k the thousands of replacement parts in s in all types and sizes, the Douglas Co., un the direction of *Roy Bruemmer*, plant ma tenance foreman, devised the present met of salvaging worn out items by metalli them.

The Douglas Co. now has specially signed metal spray booths in which num ous parts and machinery units are reclaim including drum shafts for drop hamm The rusted surfaces are machined off and shaft sprayed with stainless steel to reb it to its original dimension. One of the usual items the company is rebuilding this manner are the wing sections of m planes used in wind tunnel tests. It is ported that the firm has been able to ach closer tolerances through metallizing wing sections than by any other method

Manufacturers' Literature

Dust Collecting Systems

"*The Collection and Control of Dust and Fumes from Magnesium Alloy Processing*" is the title of a new booklet just issued by *Peters-Dalton, Inc.*, Dept. MF, Detroit. Written by *O. E. Fenn*, in ten chapters, it covers such subjects as Requirements of Dust Collecting Systems, Safety Precautions, Use of Proper Precipitating Fluids, Cleaning with Metallic Abrasives, Suggested Air Volumes and other valuable information of interest to fabricators of magnesium alloys.

Conductivity Measurements

To describe instruments for making precise conductivity measurements in plant, laboratory or classroom, the *Leeds and Northrup Company* has just revised its catalog. "Apparatus for Electrolytic Conductivity Measurements in Laboratory and Plant." It should be of special interest to anyone who is considering new equipment and wants the very latest specifications on instruments, conductivity cells and accessories.

This revised publication presents much the same data about methods of measurement and notes for selection and use of the apparatus as did the previous edition. But, in addition, it illustrates and describes a Signalling Conductivity Controller and several new industrial cells which have become available since the earlier edition was issued.

For a copy of this 44-page Catalog EN-95, 944 edition, write to Leeds and Northrup Company, Dept. MF, 4934 Stenton Avenue, Philadelphia 44, Pennsylvania.

Rotary Files

The Rotary File Company, Dept. MF, Stratford, Connecticut, has issued a handsomely-illustrated new catalog in standard file size.

Besides featuring the company's full line of standard shapes in hand-cut rotary files, together with a number of special designs, the booklet gives historical sidelights on the development of modern hand-cut rotary files and a description of the unique craftsmanship demanded in their manufacture.

This interesting, well-presented material goes far toward explaining industry's growing dependence upon the hand-cut rotary file for "clean-up" jobs where accuracy and finish are required, and where production has to move at a fast pace.

It is a story of more advancement in industrial technique, contributing to those "ready made" skills which have enabled our production men to work war-time "miracles."

All varieties of tooth cuts are shown, and a wide range of ingenious file shapes. The book, in effect, provides the production executive or shop foreman with a blueprint for his guidance in selecting the appropriate types of rotary files for either ordinary or extraordinary applications.

AUGUST, 1944

ORGANIC FINISHING

SECTION OF METAL FINISHING

LACQUERING • ENAMELING • JAPANNING • PAINTING

ZAPON DURANITES IN USE...

This Advertisement reprinted from INDUSTRIAL MEDICINE, April 1944

are Strong Selling Factors

Manufacturers choose Duranites for their products for four sound reasons: One, because they can depend on Duranites to give their products complete and lasting protection; Two, because they know from long experience that Duranites economically provide a finish that is superior in eye-appeal; Three, low production cost, and Four, the name — *Duranite* — itself *is* a potent sales factor — representing the highest qualities of a finish.

ZAPON DIVISION ATLAS POWDER COMPANY

Eastern Sales: Stamford, Conn. Western Sales: No. Chicago, Ill.

INDUSTRIAL FINISHES — *For Your Products of Tomorrow*

Section of
METAL FINISHING
Founded January, 1903
as Metal Industry
Publication Office
11 West 42nd St.,
New York 18, N. Y.

ORGANIC FINISHING

SECTION OF METAL FINISHING

AUGUST, 1944

CONTENTS

~

Cover Photograph

king armature coils in gas fired
d convection ovens. *Photograph*
esy Despatch Oven Co., Minne-
s, Minn.

PHOTOGRAPHIC RECORDS and REFERENCES in FINISH TESTING

As everyone in the finishing industry knows, progress in organic finishing depends largely on conclusions drawn from laboratory tests and from field observations of finishes in actual use. Unfortunately, because finish failures are often due to a number of incompletely understood interrelated factors, evaluation of finish performance tends to be subjective and personal judgments rather than quantitative data must be used.

A long stride toward strictly objective and quantitative finish evaluation is the use of photographs. In many instances, final conclusions depend as much on the progress of a test as on the results at the end of the test. Word descriptions of the progress of finish breakdown can be made but obviously leave much to be desired. A series of samples started at various intervals can show progress but such a procedure also possesses disadvantages as all who have conducted finish tests well know. A series of photographs, however, comes closest to being most satisfactory. A properly prepared photographic record supplemented by descriptions of test procedure and opinions of a trained observer is complete and permanent.

In the matter of comparing test results made at different times or by different operators on either the same or different finishes, photographic standards for reference are also of great value. Here again word descriptions can be most unsatisfactory. The advantages of a series of photographs showing types and degrees of film breakdown need not be described.

Photographic records and standards for reference must, of course, be carefully prepared. The various types of breakdown which may occur on the same test piece must not be confused. Breakdown may vary in extent over the area of a single test piece and, for purposes of comparison, either the whole piece or a carefully selected representative area must be chosen. A large number of photographs must be taken since a single one may not tell the whole story.

The use of photographs in evaluating finishes, of course, necessitates rather expensive equipment and technicians trained in its use. There are, however, numberless instances where the cost is justified. As the worth of this tool becomes appreciated it will find increasing use and finishing will be that much closer to being the science it should and can be.

L. H. LANGDON, *Publisher* • WILLOUGHBY G. SHEANE, *Associate Editor* • T. A. TRUMBOUR, *Business Manager*

ANNOUNCING

A NEW DETERGENT

for STEEL *Processed with*

HARD-TO-CLEAN *Lubricant*

Many alkali cleaners remove simple oils, but hard-to-remove lubricants of the extreme pressure type require high detersive action such as provided by Enthone Cleaner 100. ☆ This remarkable new type of alkali cleaner speedily decreases the toughest compounds. ☆ It successfully eliminates pre-cleaning. ☆ It works where other products fail.

Cleaner 100 is another result of pioneering research by the Enthone Technical Staff that is going to town. ☆ Read these reports.

CASE 484

Prominent electronics equipment manufacturer. Plating steel chassis. Cleaner required high current density to be effective. Corners of chassis where there was low current density not cleaned. Result: peeling of the plate. Changing to Cleaner 100 eliminated this trouble. Because of its high detersive action Enthone Cleaner 100 does not need high current density. This feature also accounts for its spreading preference as a soak cleaner as well as an electrolytic cleaner.

CASE 492

Leading manufacturer of totalizing machines. Pre-cleaning parts with trichlorethylene with a well-known brand name. After changing to Cleaner 100 reports: "Working beautifully . . . saves enough money by eliminating degreasing to pay for Cleaner 100 and make a profit to boot."

Order enough for convincing demonstration today . . . at our risk. Full instructions will come with the shipment.

THE ENTHONE COMPANY ENTHONE **444 Elm St., New Haven, C**

CLEANER-100

A MODERN FAST ACTING ALKALI CLEANER FOR STEEL

NEWS FROM WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Aliphatic Alcohols Transferred to Order M-300 Higher Aliphatic Alcohols Order M-344 was revoked by the WPB on July 8, 1944 and the allocation control of such alcohols were transferred to Order M-300. At the same time, oleyl alcohol was added to the higher aliphatics alcohol schedule, 33 of M-300. A small order exemption of 40 pounds is specified for oleyl alcohol in Schedule 33 of Order M-300.

Aluminum Powder and Paint Given Careful Consideration The Aluminum and Magnesium Division of the WPB announced on July 7, 1944 that it would give favorable consideration to the requests of distributors of aluminum powder and paint "to accept late delivery of unrated orders for pigments from a person other than a producer who received but did not ship the distributor's order between May 15 and June 30, last." It was also made clear that distributors' inventories of aluminum powder and paint as of March 15, 1944 may be sold as provided in Supplementary Order M-1-g beyond June 30, 1944 without preference ratings or limitations as to end use.

Aromatic Petroleum Solvents Restrictions Eased In amending Conservation Order M-150 on June 30, 1944 the restrictions on the uses of aromatic petroleum solvents were eased. In Schedule A restrictions were reduced on 54 items—items for which only small amounts were required. At present there are only 38 forbidden end uses in Schedule A. Three new uses were provided for in the amended order under Schedule B. These new uses are (a) for vinyl coatings (on military orders only) where spray application is required; (b) for specification coatings (on military orders only) where required by the contract; and (c) for brake lining, clutch facing and coated abrasives. Class B solvents are now permitted as coatings for such aircraft equipment as instruments and parts. Prior to this amended order such coatings were restricted to propellers, motors, generators, engines, fuel tanks, and metal bodies and wings.

Methyl Isobutene Ketone Under Order M-300 Orders M-322 and M-230 which covered methyl isobutene ketone were revoked on June 22, 1944 for the purpose of bringing these chemicals under the allocation control of amended Order M-300. At the time this transfer of allocation control was made the WPB announced that because of the shortage of butyl acetate, butyl alcohol and other high boiling solvents, an increasing number of lacquer manufacturers have been using methyl isobutyl ketone. To keep close taps on the end use of methyl isobutyl ketone, the customer, under provisions of M-300, will be required to file form WPB-2945 instead of the customer's end use certificate which was required under Order M-322.

Beeswax Supply Is Ample It was learned from the Chemicals Bureau of the WPB that since the lifting in June of import restrictions on beeswax and carnauba wax the supply of both materials is now sufficient to meet present civilian and military needs.

Butyl Alcohol Allocations Tightened The Chemicals Bureau of the WPB announced on June 26, 1944 that the allocations for butyl alcohol and butyl acetate which are used in lacquer solvents will be sharply cut for a short period because of the increased demand for these chemicals for military and Lend-lease purposes. No interim or emergency allocations were made in July except for urgent military purposes.

Allocation Order M-370 Clarified Chrome pigments manufactured as reaction products, instead of as precipitation products were included in the definition of zinc chromate according to Allocation Order M-370 as amended July 6, 1944. The amended order also provides for the inclusion in the "exempt order" definition the purchase orders for Class A pigments for the manufacture of marine paints.

Ethyl Alcohol Exception Ethyl alcohol Allocation Order M-30 was amended on July 10, 1944. In this amended order it states that the term ethyl alcohol does not "include ethyl alcohol which has been tax paid for beverage purposes."

Fibre Shipping Drum Controls Simplified Fibre Drum Limitation Order M-313 was revoked on July 1, 1944 and replaced by Limitation Order L-337 which has simplified the controls over fibre shipping drums and pails. Under the new order no letter of application is required for listed products. Schedule A of the order includes chemicals, and miscellaneous items such as clays and soaps. Schedule B of the new order authorizes the use of fibre drums, under limited quotas ranging from 50 per cent to 100 per cent of 1943 for such commodities as paints and their ingredients.

Glycol Ether Small Order Exemptions Raised Glycol ethers Order M-336 was revoked on July 12, 1944. The control of these ethers were transferred to Order M-300. Under Order M-300 the small order exemptions were increased from 400 to 4,000 pounds for monobutyl ether of ethylene glycol; monomethyl ether of ethylene gycol was raised from 430 to 2,150 pounds; monoethyl ether of ethylene glycol was stepped up from 410 to 4,100 pounds; and monoethyl ether of diethylene glycol was increased from 460 to 2,300 pounds. To provide a tighter control over the end uses of these ethers suppliers are required to submit form WPB-2946 for authorization to deliver glycol ethers, and the customers must file form WPB-2945 for authorization to accept the materials.

Alkyd Resins Uses Limited The WPB on July 15, 1944 limited the use of alkyed resins for certain specifications such as AN-TT-P-656a Zinc Chromate Primer, AN-L-21 Camouflage lacquer, AN-TT-L-51 Cellulose Nitrate Lacquer, M-542 Tinting Paste for all aircraft end uses; S-142 Seam Sealing Zinc Chromate Tape, AN-E-3 Gloss Enamel, AN-E-& Camouflage Quick Drying Enamel, and M-559 Anti-Fowling Paint for aircraft metal bodies and wings; AN-TT-E-501 Black heat-resisting Glyceryl-phthalate Enamel and AN-E-3 Gloss Enamel for aircraft motor generators and engines; and AN-TT-L-51 Cellulose Nitrate Lacquer for aircraft instruments other than radio and radar.

Phthaltic Alkyd Resin Coatings Must Be Authorized The WPB Chemicals Bureau revealed on July 12, 1944 that emergency military orders are not exempt from the provisions of Order M-139 which states that, (except where free stocks are involved) paint manufacturers must receive WPB authorization before they are permitted to ship any protective coatings which contain phthalic alkyd resins.

VICTORY WRINKLE FINISHES

without CHINAWOOD OIL and also without ALKYD RESIN

With the main source of chinawood oil in enemy hands, temporarily, our research laboratory has developed a good wrinkle finish without this critical material. Our laboratory has also developed another good wrinkle finish without the use of phthalic alkyd resin, as required by WPB order M-139, Direction 2, dated May 26, 1944, due to the country's shortage of phthalic anhydride. Both of these finishes have been highly satisfactory. Our Victory Wrinkle Finishes give results similar to our well known Duart Wrinkle Finishes and can be successfully used in production. Our experience proves that they provide a tough, durable finish of the desired pattern and cover surface imperfections in a single coat, using ordinary methods of application. Your inquiry is invited.

Formula for a quick "Finish" Buy more WAR BONDS

M & W

MAAS & WALDSTEIN COMPANY, NEWARK, N. J.

PRODUCERS OF LACQUERS, ENAMELS, SYNTHETICS AND SPECIALTY FINISHES FOR ALL PURPOSES

BRANCH OFFICES & WAREHOUSES: 1658 CARROLL AVE., CHICAGO, ILL. • 1228 W. PICO BLVD., LOS ANGELES, CALIF.

Finishing Soldiers' Helmets

By FRANK V. FAULHABER

Brooklyn, N. Y.

(CONCLUSION)

Pickling Points

AGITATION in pickling tanks expedites reactions and improves the effectiveness of the solutions. This can be accomplished by raising and lowering an assembly of helmets several times or by introducing compressed air at the bottom of the tank. In the cleaning and neutralizing tanks, where the solutions are kept boiling, sufficient agitation will be present.

Agitation appreciably decreases the pickling time at room temperatures. As the temperature of the bath is increased, the difference in time decreases. At about 180° to 190° F. the difference is negligible.

From time to time fresh acid should be added to maintain the strength at the desired percentage until the iron content has increased to the point where it appreciably retards pickling time. Periodically, the bath should be thrown away and a fresh solution made.

Temperature Uniformity

Another important detail relates to temperature while the helmets are being painted. In many instances, unsatisfactory work occurs because working conditions are not correct and uniform. Both the paint materials and the painting equipment should be at room temperature. If the spray painting equipment is cold, perhaps brought in from another room, the paint will not flow efficiently. To make matters worse, if the paint has just been brought in from outside, from the cold, smooth, superior workmanship cannot be expected. As previously indicated, there is a thinner limit on these helmet paints. Over-thinned materials result in lack of body in the finished coating.

Sufficient, finishing materials should be stored in a special room. These ready-for-use paints should be as warm or almost as warm as the finishing room. This makes the paints immediately workable without disconcerting delays. Preheating overcomes this problem. In similar manner, consideration should be given the metal paint containers so that these will not be cold and thus affect the consistency of the paint materials. Moisture may be condensed from the air when these containers are only partially filled and suddenly transferred to a warm room. The finishing plant's compressed air lines, spray guns, metal racks as well as the helmets themselves should be at room temperature. If any finishing perplexities arise, consider these possible causes.

Uniform Consistency

Uniform consistency of paint is especially important in the coating of the soldiers' helmets. In incorporating the finely ground cork in the special paint mixture, it is not desirable to tamper with the vehicle any more than absolutely necessary. It is not only a question of obtaining a smooth, efficiently running paint. The correct thickness of film also must be applied according to government specifications. Economizing on paint by reducing the finishing material can not be considered.

Care and Conservation

Today, more than ever, it is necessary to take proper care of spraying equipment, not only in the interests of conservation but also for the purpose of maintaining a uniform, efficient finishing schedule. It will usually be found that manual spray operators who have the proper regard for the equipment they use are the ones who take care of it and also use it correctly and efficiently. This is a vital point and no shop management, however rushed and filled with orders, can afford to let it go unconsidered. In fact, it is precisely those finishing plants plunged deeply in work where the temptation prevails to skimp on, if not entirely skip, the necessary care and cleaning of the spray equipment. And it is precisely these plants that can least afford to hold up production that are most likely to be caught unprepared.

In those finishing plants operating with manual spray equipment, as previously discussed, the interior of the helmets are first coated. Before applying the exterior ground cork coating, the preceding paint application must be thoroughly dried. While much helmet work is being dried with infra-red equipment, this newer apparatus is mostly in operation in the larger establishments where automatic spraying equipment is installed and where this newer drying system is co-ordinated with a larger production schedule.

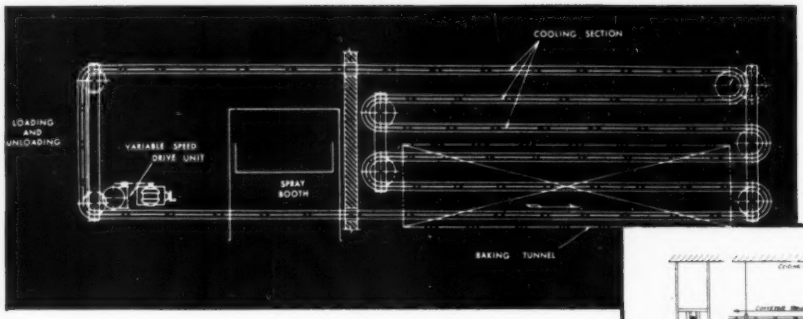
Large scale production naturally justifies use of automatic spraying equipment for finishing of the helmets. In this case a special finishing set-up is provided. The arrangement comprises two compartments, one for spraying the interiors of the helmets, the other the outsides. The helmets, traveling on a horizontal conveyor, are mounted on spindles which start revolving as soon as the conveyor enters the first spray booth.

Painting Procedure

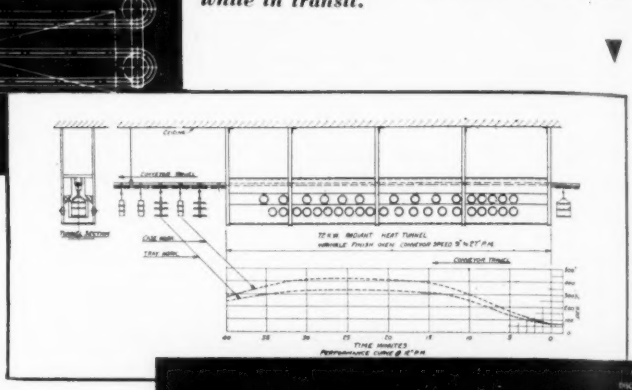
When the helmets come within range of the first set of spray guns a cam-operated valve causes the guns to start spraying. These guns are positioned to coat the under and inside of the helmet with a coat of lustreless olive drab synthetic enamel, in accordance with the Government's Specification ES-No. 171 as mentioned earlier in this article.

The helmets advance with the spraying operation. After a helmet has passed beyond range of the spray guns, the control valve closes and the guns cease spraying until the next helmet is in spraying position.

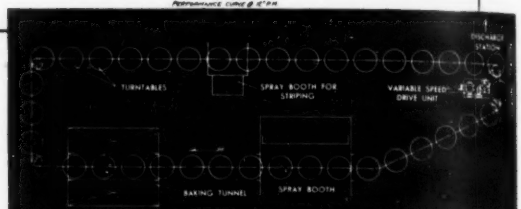
The helmet then passes into the second spray booth where, in a similar cycle, it is sprayed on the outside with a similar finishing material, mixed with ground cork as previously explained.



PLANT No. 2 — *Manufacturer of aircraft radio parts reduced finishing time by 50%; cut manpower requirements 66⅔% by continuous processing of parts while in transit.*



PLANT No. 1—*Equipment manufacturer reduced fuel and power 75%; cut rejects up to 30%; saved 50% of former finishing space; reduced operators from 13 to 6 with this G-W coordinated system.*



PLANT No. 3—*Manufacturers of sheet metal specialties cut rejects 35%; reduced power costs one-third; cut paint room space from two floors to one; eliminated many individual spray baths and ovens (and their maintenance) and released their attendants for other work.*

EACH G-W INFRA-RED SYSTEM DESIGNED FOR ITS SPECIFIC JOB!

To get for you all the advantages of radiant heat baking and drying, an infra-red system should be designed to coordinate with other plant operations. In such a system planned conveying is of great importance.

From the unfinished product right through the spraying or dipping, baking or drying, and cooling operations up to the shipping platform or warehouse, the conveyor carries responsibility for profitable operation.

Gifford-Wood brings long experience and "know-how" to the custom-built material handling equipment it designs, makes and installs. Pioneers in infra-red processes, its engineers specialize in fully coordinated systems for planned conveying. Write for a G-W engineer to call and consult on a system to fit your plant operations or write for Bulletin 0-150.

RADIANT HEAT DRYING ADVANTAGES

1. Cuts Rejects Through Closer Control of Finishes.
2. Triples Drying Production.
3. Reduces Floor Space.
4. Cuts Power and Fuel Costs.
5. Lessens Equipment Costs.
6. Reduces Overhead.
7. Saves Manpower.

GIFFORD-WOOD CO.

FOUNDED 1814

420 Lexington Avenue
New York 17

HUDSON, N. Y.

565 W. Washington Street
Chicago 6

HEADQUARTERS FOR INFRA-RED BAKING AND DRYING

6072

ollowing the spraying operations, the helmets pro- into a drying oven and continue on the conveyor to unloading and assembly station. The actual spraying the soldiers' helmets is performed under conditions ch similar to the automatic spraying of many another duct. Helmet spraying follows closely the principle d in finishing civilian products of comparable size and pe when handled in volume and at high speed. Essenly, it is simply the passing of a revolving object before ixed position spray so that all surfaces will be adetely and uniformly coated.

The spray gun nozzle must be enlarged to handle the vy ground cork material and some spray gun adjustnts be made for balance. This particular spraying uirement is usually attended to by the manufacturers the spraying equipment. They test the equipment and it out before shipping it to their customers. Here it merely a matter of following a procedure much akin that attending the furnishing of any other specialized aying apparatus. The proper nozzle combination acpanies the spray guns to assure satisfactory permance with the specific finishing material to be used der the particular conditions that may exist.

Maintaining Equipment

t will be found that the less tampering that is done h the equipment, beyond such necessary handling atding cleaning and care, the more uniform and efficient finishing operations will be. The finishing plant that done a good day's work today will be more likely to n out an equally satisfactory volume tomorrow if, at close of the day, steps are taken to remove all excess ishing material from the guns, hose and tanks. A sufient amount of solvent appropriate for the finishing terial used in the paint tanks should be placed in these ne containers, then sprayed as usual. Following this ocedure, the guns and fluid lines should be blown out h compressed air.

The lines connecting containers and spray guns should disconnected, washed out thoroughly and then reasmbled. This assures a better, smoother flow of the fining material the following day, without any sudden inferences and interruptions that may retard the entire oduction schedule.

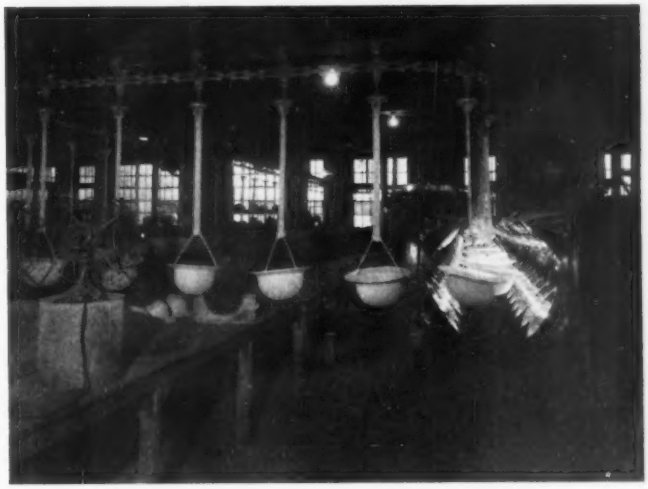
Spray guns should be properly clean and free-working. broom bristle or equally pliable cleaner may be used remove hardening paint from the holes in the air cap. suitable solvent may be used as aid for this purpose. hen putting the gun together, care should be taken to that the air cap and the holding nut are tight against spray head. Looseness of the air cap may result in ishing material dripping at the gun nozzle and otherse interfere with correct operation. The fluid needle st be placed properly. This may sometimes prove difult if the finishing material is permitted to harden in fluid tip, or because of the gripping of the needle by packing in the packing nut.

In using solvent as a cleaner, it should never be the actice to immerse the entire spray gun in the fluid. lvents remove lubricants and dry out packings. Incintally, all moving parts should be lubricated daily. e fluid needle packing should be removed occasionally d softened with oil. The fluid needle spring should be coated with grease. The guns of automatic equipment should receive oil daily at the piston leather in the air cylinder at rear of the spray gun. A few drops will suffice. The piston leather should be removed occasionally and a coating of light grease applied to the interior of the air chamber. All this is particularly important when the equipment is steadily in use.

In the finishing of soldiers' helmets, as with the spraying of any other article, periodic attention to all the details having bearing on the final completed product, that in some finishing plants may be passed by, is bound to result in a vastly improved work schedule, with fewer halts and break-downs. It is consideration of these details that eliminate difficulties that otherwise may develop into grievous and costly losses. Apart from the resulting conservation of the plant's equipment, the management also gains by reason of its more successful product.

Infra-Red Drying

Following the spraying, the helmets proceed to the drying ovens. In many of the larger establishments the drying of the finish is being done by the infra-red process. This newer means of industrial drying has many advantages and is especially suitable for helmet work. Those plants with volume production find the infra-red method of drying particularly useful, since only a few minutes are required to dry the finished helmets. In photograph below can be seen the drying of another type of helmet, used by air raid wardens.



Infra-red baking synthetic enamels on civilian defense helmets.

These civilian defense helmets require but 3½ minutes for drying of the finish. Synthetic enamels, such as used on soldiers' helmets, are ideally suited for infra-red drying. Some synthetic enamels, if not baking satisfactorily in an infra-red oven, may be changed slightly in formulation to adapt them for this particular process.

In constructing a radiant-convection system consideration should be given the placement of the lamps in order that the heated air may be used most effectively. The same care applies, naturally, to the arrangement of the helmets, so that everything will be coordinated properly as the helmets proceed through the tunnel. Inasmuch as only that portion of the energy which is received and absorbed can serve to raise the temperature of the product

to be dried and maintain the temperature thereon, it is advisable that the helmets should display as much surface as possible to the infra-red lamps.

A properly engineered infra-red installation obtains the maximum value from the resulting heat, while at the same time preventing over-baking or under-baking of any parts. By hanging the helmets correctly in a radiant-convection oven, such as in the illustration, the product is as efficiently dried as by any other means.

No Pre-Heating

Another feature of the infra-red drying process is that no pre-heating is required. Radiant energy responds so quickly that baking can be started or stopped at will, with no resulting heat losses or expenditure, a vital factor in considering stops during and at the ends of work periods. This is of importance in the plant where it is desired to keep a close watch on the work under process and where occasional examination of the product, necessitating halts, is necessary.

The size of infra-red tunnel necessary for the finishing of soldiers' helmets should be governed by the finishing plant's output and the operating rate. An efficient system also takes into consideration the drying or baking time of the finishing material being used. Drafts in the drying lamp tunnel can chill the work appreciably. Hence, efforts must be made to stop such drafts or else a higher concentration of energy will be required to obtain the same temperature. Of course, a certain amount of ventilation or air movement is desirable to reduce the concentration of volatile, flammable vapors to a safe minimum value.

In some finishing plants sheet steel or sheet aluminum is placed at the rear of the reflectors, especially around the lower portion of the tunnel, to reduce convection currents that otherwise might cool some of the product. Sometimes the infra-red arrangement is almost entirely enclosed in sheet steel or sheet aluminum, a vent taking care of all resulting fumes.

As with the use of any heat for special industrial purposes, the necessity for experimentation and re-arrangement of an infra-red drying installation, may be reduced to a minimum by obtaining advice in respect to local fire regulations. While no particular difficulty should be encountered in this direction, it is remarkable how the violation of some minor matter affected by local fire laws or rules can sometimes cause a plant management a long run of worries until an efficient and satisfactory industrial heat arrangement has been correctly installed.

Less Fire Hazard

There really is no more fire danger attending the use of an infra-red drying unit than with any other industrial heating means, if all the details have been taken care of properly. As a matter of fact, the fire hazard is less since the accumulation of solvent fumes is small. When the infra-red unit is installed a distance from the spraying booths, the explosion hazard almost vanishes. Where considerable steel equipment is used a fire hazard becomes more pronounced.

It is advisable of course, for a number of reasons, to keep the drying lamps in good order. This calls for regular cleaning, for, when these infra-red lamps are in good shape, there is good insurance for safe plant operati Furthermore, properly cleaned lamps will operate m efficiently and operating expenses will be reduced. Regul lamp care will help conserve this industrial equipment.

The infra-red lamps and also the rest of the drying u should have regular care to reduce upkeep to a minimu The lamps and the reflectors should be cleaned thorough about once a month and more often if the work is co siderable and steady. Paint and other interfering m terials that may gather on the drying lamps or reflecto are certain to affect the efficiency of the process. By a of a soft cloth and a mixture of a good thinner and la black, paint film and all particles can be wiped off t reflectors. This will enhance the reflectivity. It is a visable not to scratch or abrade the highly polished s faces of the reflectors. Hence, the cleaners and co pounds used for this purpose should not be abrasive. some plants caustic soda and other harsh solutions a sometimes used for cleaning the reflectors; however, t advantages of this procedure are questionable because the extra time required and the greater likelihood of la breakage. Infra-red lamp manufacturers and supplie will furnish helpful instructions for proper lamp care a use. The same is true regarding other infra-red dryi equipment the finishing plant may be using. Taking a vantage of such assistance will result in greater pla efficiency and production.

It might be stated, incidentally, that a radiant heati system is erected with the electrical equipment exterior the oven. The wires of the unit are enclosed in spec channels which lead to a central control panel. Prop operation of the whole system is brought about throu interlocking devices. For illustration, the conveyors, t ventilating unit, the spraying apparatus and the heati are interlocked in such manner that any difficulty d veloping at any part of the operations will automatica stop the work, thereby averting possible spoilage and a fording a greater measure of safety.

The conveyor system operated in conjunction with t spraying and drying of the product itself merits co siderable thought. No two plants are alike and ea conveyor unit should be so constructed as to utilize t plant's space most advantageously for the required volum of production. No condition can be more distressing an profit-depriving than the one that prevails where the ma agement is limiting the plant's output because of the ine ficient, unsystematic finishing system it uses. There ma be no deficiency in the conveying apparatus if the manag ment's finishing plans are to function successfully an if the otherwise efficient finishing layout is to be cap talized on to the fullest extent.

All this is very important when it is considered th many finishing plants are operating two and three shift striving to meet an increasing demand for urgently needed products.

In preparing this article, the writer is thankful for th co-operation of:

Mr. B. C. Gardner, The DeVilbiss Co., Toledo, Ohio.
Miss Edith Herrig, The Fostoria Pressed Steel Corp., Fostoria, Ohi
Mr. R. E. Sibley, Leiman Bros., Inc., Newark, N. J.
First Lt. Robert C. Kingsbury, Ord. Dept., Assistant for the Co manding General, Rock Island Arsenal, Rock Island, Ill.
Mr. N. S. Baldwin, The Sherwin-Williams Co., Cleveland, Ohio.

WHAT IS VAPOR DEGREASING*?

VAPOR DEGREASING is the modern method for rapid and thorough removal of oil and grease from all types of metal products, plastics, glass and other materials. It utilizes the pure vapors of special degreasing grades of the non-flammable solvent, Trichlorethylene, and in some cases, Perchlorethylene. The degreasing process is extremely simple. It is carried out in scientifically designed equipment, built for efficient and economical operation.

In the degreasing process, the work may be given a preliminary immersion in boiling or warm solvent, or sprayed with clean solvent for mechanical removal of tenacious soil or solids. *But always, the final cleaning in any degreasing operation is the passage of the work through pure, uncontaminated solvent vapors.* This final rinse gives positive removal of the last traces of oil and grease, delivers the work clean, warm and dry, ready for inspection, assembly or finishing processes.

No other cleaning method can match the results obtained by vapor degreasing. Today it is widely used to meet wartime demands for faster production of ordnance and equipment. Tomorrow it will help to produce more goods—better goods—with maximum economy, because vapor degreasing—

1. **Thoroughly removes grease** and oil from metal parts of any size or shape, usually in a minute or so.
2. **Produces parts clean,** warm and dry—ready for inspection, assembly, further fabrication or finishing of any type.
3. **Minimizes finishing rejects** because vapor reaches and removes grease and oil from deep draws, holes and places which are almost inaccessible.
4. **Reduces risk** of damage to delicate parts.
5. **Can be used alone** or as a part of a process flow line.
6. **Utilizes** compact equipment that fits into small space.
7. **Consumes** only small quantities of solvent. Contaminated solvent is recovered economically for re-use.
8. **Uses** the absolutely pure vapors of a non-flammable solvent as a cleaning medium.
9. **Simplifies** cleaning procedure, is easy to operate as a process.
10. **Saves time and cost**—in its own operation, and in the subsequent handling and finishing of parts.

BE INFLATION WISE! Don't pay more than ceiling prices! Don't buy on the black market! KEEP PRICES DOWN!

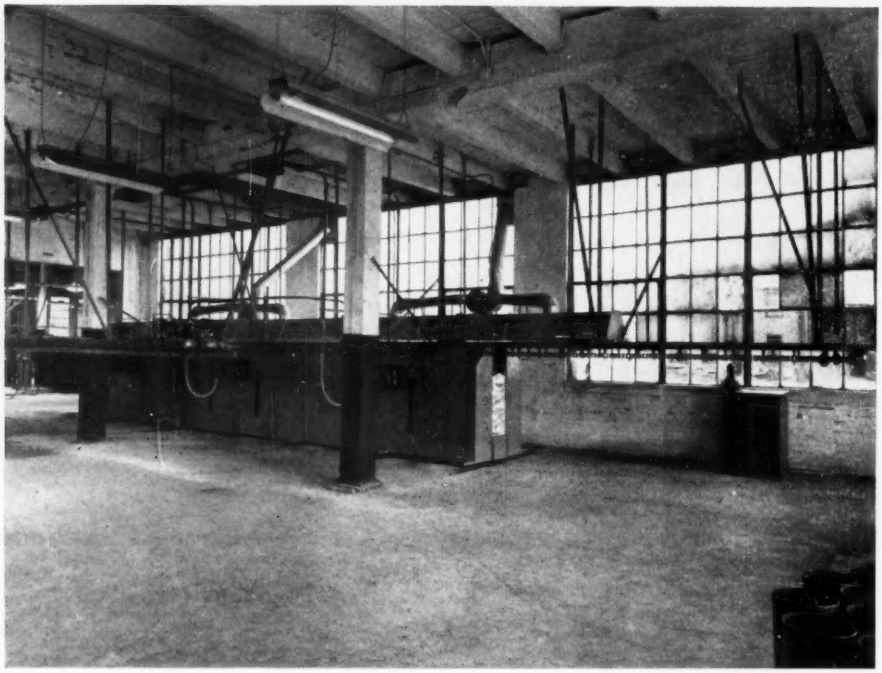
DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

E. I. DU PONT DE NEMOURS & CO. (INC.)
Electrochemicals Department
Wilmington 98, Delaware

▶ ***Vapor degreasing is basic for good metal cleaning. For each job there is a suitable cycle or combination of treatments. In every case, the final rinse in pure, uncontaminated solvent vapor assures positive removal of the last traces of grease and oil.**

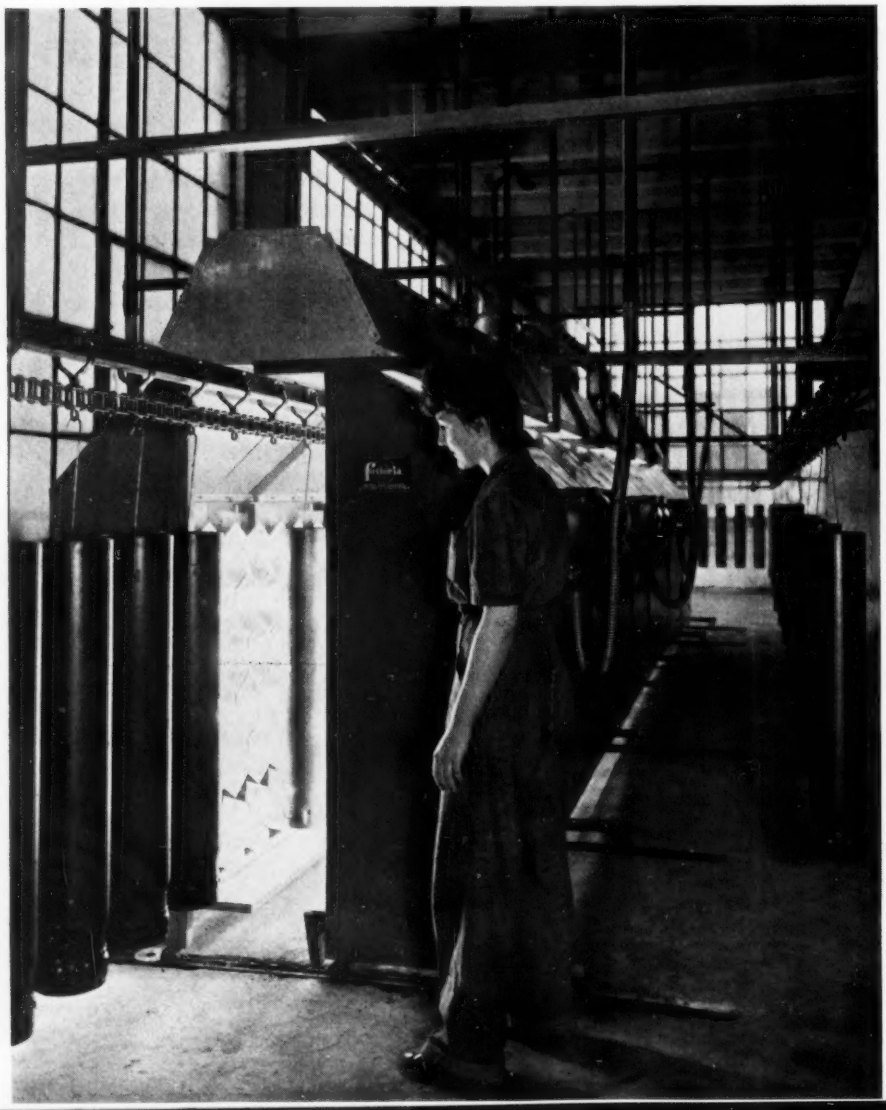
BAKING SHELL CASES WITH INFRA-RED



Data and photographs courtesy Fostoria Pressed Steel Corp., Fostoria, Ohio.

Above—General view of baking oven.

Below—Finished shell cases entering infra-red oven.



A GREAT amount of care must taken in protecting cartridges fr rust and corrosion and careful en neering work is necessary to arr at the solution to the protection pr lem. It is of prime importance t the cartridges reach our fighti forces in fit condition for use. Oth wise, our men may as well not ha the ammunition.

When Uncle Sam's fighting for move in on the enemy, it is oft necessary to supply large amou of shells for the beachhead positi or for those who are working inla from the beachheads. The pract is to move in toward the shore to certain position at high tide and t load the shells. Then, at low ti the land forces remove the shells the supply base. Often the shells completely covered by silt and sa Sometimes the shells may lay in t water for days before being remov

To afford adequate protection, U. Army Ordnance designed a steel sh case to provide protection from t salt water. A coating is applied both the inside and outside of t case and must meet rigid specifi tions. From the production sta point this coating must bake quick to meet demands for economy a speed.

The infra-red process is being us extensively for the baking operati on these case coatings. This part ular method has proven popu among the producers of the sh cases because it does the job quick and satisfactorily. A description baking 105 mm. shell cases follow

The case for 105 mm. cartridges fabricated of 16 gauge steel, 6" diameter and 34" long. The fin is Army specification OD-3-181 ty Two.

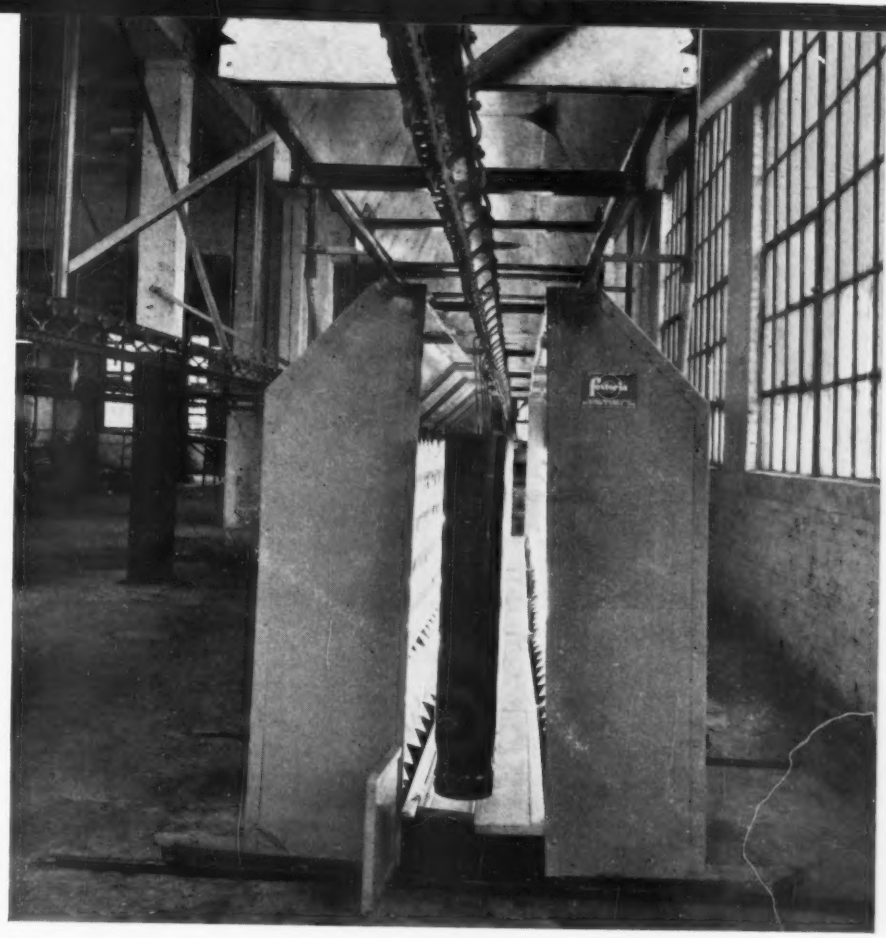
After being dipped and drai the case enters the infra-red tun where it reaches a temperature 325° F. in 3 minutes. It maint approximately that temperature another five minutes, which establis the baking cycle of 8 minutes. Af a short cool down period the ca are ready for packing and shipp to the supply depot where the c tridges are sealed within the case

To bake 105 mm. cases in 8 m utes with infra-red requires a bak

tunnel approximately 48′ long with a connected load of 240 KW. One section of the tunnel uses 375 watt lamps to bring the temperature up to 325° F. quickly. After the initial period, 250 watt lamps hold the desired temperature for the remainder of the baking period.

If smaller cases are to be baked also, it is possible to wire the tunnel sections so that various rows of lamps can be turned off. With such control, the number of lamps necessary to bake the various size cases can be used. Such an arrangement provides real flexibility and results in saving of electricity.

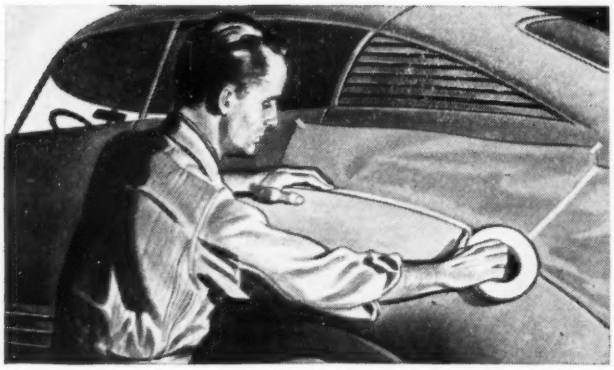
Infra-red installations can be installed easily on ceilings and other out-of-the-way places when floor space is scarce. The process can be used with overhead or flat conveyors for either dip or spray finishing. The speed with which it operates permits quick packing and shipping, thus eliminating the necessity of floor space for drying and stand out periods.



Shell cases emerging from oven.

Do you know...?

Quiz on timely production short-cuts—No. 5



Q. Two-tone painting of post-war cars will make them look:
☐ Larger ☐ Smaller ☐ More streamlined

A. Depending on how it's done, two-tone painting can produce almost any desired effect. Wherever two or more tones are needed, Permacel masking tape helps do the job quicker, better. Holds tight till the job is finished, then strips off easily—leaves clean surfaces, razor-sharp edges.

Q. Tape is used in women's shoes:
☐ In place of laces ☐ To reinforce ☐ For decoration

A. To reinforce portions of heels, insteps and toes. A special Permacel shoe tape provides reinforcement just where needed—also cushions the strip of metal in the instep. Another interesting example of the Industrial Tape Corporation's ability to develop special tapes to meet unusual and exacting requirements.

Q. Insignia and identification on hospital cars are often applied:
☐ With paintbrush ☐ With spraygun ☐ With stamp

A. With spraygun. Permacel paper masking speeds the job of painting insignia and identification on hospital cars, freight cars, ships and many other vehicles. Permacel is used to mask the design—protects surfaces surrounding the symbol during painting—then strips off clean—leaves perfect angles, clean-cut color edges.

Q. Greatest danger to which these idle planes are exposed is:
☐ Enemy bombing ☐ Corrosion ☐ Sabotage

A. Corrosion. Also damage from dust and dirt. That's why ground crews often seal vulnerable openings and vents of idle airplanes with Permacel moisture-proof cloth tape (Utilitape). After the war this Permacel tape will be available in nine sun-fast colors to help protect against moisture, dirt and corrosion.

Q. Simplest device for keeping undesirables out of plants is:
☐ Passes ☐ Lie detector ☐ Poison gas

A. Passes. Many war plants use passes wrapped with Permacel's companion, Texcel cellophane tape. Signatures, fingerprints, photos, are "sealed in"—cannot be altered without leaving tell-tale signs. Many other valuable documents can also be protected with this durable cellophane tape.

Q. Which of these types of pressure-sensitive tapes can help speed and improve *your* production?
☐ Paper ☐ Cloth ☐ Cellophane ☐ Metal ☐ Glass

A. All of these types of Permacel tapes are today used in war production. Many war uses will prove helpful in your business when you return to post-war work. Meantime, our research laboratory facilities are available to you for development of special tapes to meet war or post-war needs.

Permacel
INDUSTRIAL TAPES
INDUSTRIAL TAPE CORPORATION
New Brunswick, N. J. Makers of Texcel Tape

Methods and Standards for Gloss Measurement of Camouflage Materials

By RICHARD S. HUNTER

National Bureau of Standards, Washington, D. C.

LOW gloss is necessary in camouflage materials to prevent them from attracting attention. Therefore, camouflage materials purchased by the armed forces must meet low gloss requirements. In most of the specifications now being used for the procurement of camouflage materials, these requirements are given on the scale defined by Procedure A of ASTM Tentative Method D523-41T for the Specular Gloss of Paint Finishes. In a few specifications, however, other methods for testing gloss are defined.

On a number of occasions during the past few years, different laboratories, measuring identical samples using supposedly identical instruments, have failed to agree on the gloss values obtained. The confusion which has resulted from these disagreements has caused delays in the manufacture of materials needed for war and in their acceptance and use.

The frequent occurrence of this trouble led to the calling of a conference on the gloss measurement of camouflage materials which was held at the National Bureau of Standards on May 14, 1943 and was attended by representatives of the armed forces interested in the gloss control of camouflage materials. The present article is based on the information used at this conference to explain the sources of discrepancy in gloss measurements and also on the recommendations which were made for obtaining satisfactory agreement.

It should be noted that the disagreements discussed below are solely those between instruments applied to identical test specimens. It happens that panels prepared from identical wet paints may differ in gloss because of differences in methods or conditions of preparation. No attention is given in the present article to such sources of discrepancy.

Measurement of Low Gloss

It is commonly assumed that the light reflected by the average painted-metal specimen can be divided into two components: (1) light specularly reflected and (2) light diffusely reflected. These two components differ in the following respects:

	Specular Reflection	*Diffuse Reflection*
Location of reflection	Surface of specimen	Pigment beneath the surface
Directions in which light is reflected	Direction of mirror reflection and adjacent directions	Uniformly distributed in all directions according to the cosine law.
Appearance attribute corresponding to fraction of light reflected	Glossiness	Lightness (Black-to-white scale)

Gloss is a term related to the ability of objects to reflect light specularly.

It is furthermore commonly assumed that objects distribute reflected light in such a way that, when unidirectionally illuminated, the brightness of the average surface will vary in approximately the manner illustrated by curve A, Figure 1. The semi-circle is supposed to represent light diffusely reflected per unit projected area and the hump is supposed to represent specularly reflected light centered about the direction of mirror reflection. Actually, the light reflected by most low gloss objects cannot be separated in as simple a manner as is suggested by Curve A. Curve B shows the distribution of light reflected by a typical low gloss object. This curve cannot be readily separated into two components like those of Curve A.

The reflective properties of an object associated with its gloss are, therefore, completely determined only when the object's power to reflect light is measured for all combinations of directions of illuminating and viewing in which the presence of specularly reflected

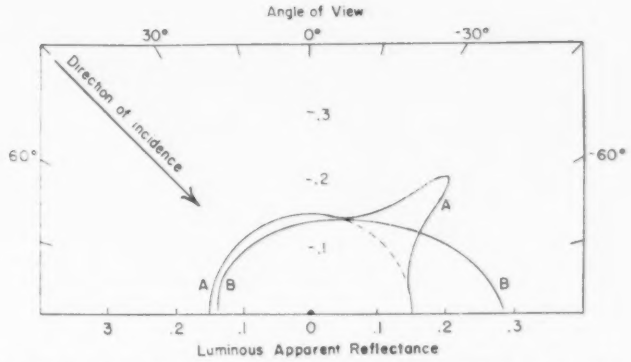


Figure 1.—Variation of brightness with direction of view of (A) an idealized, low-gloss object and (B) an actual low-gloss object; unidirectional illumination at 45°.

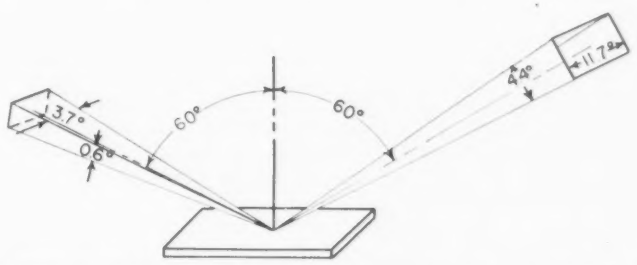


Figure 2.—Diagram showing the spreads of directions of illuminating and viewing within which reflected light is treated as specularly reflected light in Procedure A of ASTM D523-41T.

TYPE OF GLOSS	APPEARANCE ATTRIBUTES	DIAGRAMMATIC REPRESENTATION	CLASSES OF SURFACES INVOLVED	GLOSS RANGE INVOLVED
SPECULAR GLOSS	SHININESS, BRILLIANCE OF HIGH LIGHTS	S	PAINTS, SURFACES OF MODERATE GLOSSINESS	MEDIUM GLOSS
SHEEN	SHININESS AT GRAZING ANGLES	SH	MAT PAINTS, PAPERS AND LOW-GLOSS SURFACES	LOW GLOSS
CONTRAST GLOSS	CONTRAST BETWEEN SPECULARLY REFLECTING AREAS AND OTHER AREAS	D S	PAPERS, MAT AND SEMI-MAT FINISHES, WHITE AND LIGHT-COLORED MATERIALS	LOW GLOSS
ABSENCE-OF-BLOOM GLOSS	ABSENCE OF SMEAR OR EXCESS SEMI-SPECULAR REFLECTION ADJACENT TO REFLECTED HIGH LIGHTS	BL	SURFACES IN WHICH REFLECTED HIGH LIGHTS AND IMAGES MAY BE SEEN	HIGH GLOSS
DISTINCTNESS-OF-IMAGE GLOSS	THE DISTINCTNESS AND SHARPNESS OF THE MIRROR IMAGES	NOT YET MEASURED AS FUNCTION OF DIRECTIONAL REFLECTANCE	FINISHES, ENAMELS, LACQUERS, GLAZES, AND ALL SMOOTH IMAGE REFLECTING SURFACES	HIGH GLOSS
SURFACE-UNIFORMITY GLOSS	SURFACE UNIFORMITY, FREEDOM FROM VISIBLE NONUNIFORMITIES	NOT MEASURED AS FUNCTION OF DIRECTIONAL REFLECTANCE	GLOSS AND SEMI-GLOSS SURFACES OF ALL TYPES	MEDIUM TO HIGH GLOSS

TABLE I—Tabulation of six types of gloss according to appearance, method of measurement and classes of specimens.

light is suspected. Such analyses are complex and cumbersome. For practical purposes, scales on which the gloss of any object can be represented by a single number are desired. Scales of this type have to be developed empirically and five factors have to be given to describe any such scale.

1. The type of gloss to be measured
2. The geometry of the method of measurement, including the spread of the directions of reflection within which light will be measured
3. The spectral characteristics of the source and receptor
4. The reference standard used
5. The presence or absence of a correction for diffuse reflection (for specular gloss and sheen only).

Each of these factors will be considered briefly.

1. *Types of gloss.* In 1937 it was shown [3] that there are at least six different ways in which the amount and distribution of light specularly reflected from objects influences glossiness judgments of persons experienced in the commercial grading of these objects. These six different criteria for grading gloss, or these six different types of gloss as they were called, are listed in Table 1 which has been copied from a paper by Hunter and Judd [5]. Only the first three of the listed types of gloss need be considered here because the remaining three apply mainly to high gloss objects.

Specular gloss is said to be determined by the fraction of a unidirectional incident beam of light which an object reflects in the direction of mirror reflection. This fraction tends to correspond closely to the shininess which the object will appear to have. Sheen also corresponds to shininess, but for sheen the directions of illuminating and viewing are near the grazing angle. Frequently objects with low specular gloss will be found to appear surprisingly shiny when they are examined at a near-grazing angle. One government purchasing authority requires that camouflage paints purchased by it have low sheen as well as low gloss because it is felt that the military objects coated with these paints may sometimes be viewed by the enemy in situations in which high sheen would help reveal their presence.

Contrast gloss differs from specular gloss in the observer's manner of recognition. Specular gloss refers to the strength of a reflected highlight without reference to its surroundings. Contrast gloss refers to an evaluation of the highlight by contrast with the brightness of the diffusely reflecting surrounding areas of the same object. Contrast gloss is ideally suited for the measurement of camouflage materials which are so low in gloss that their highlight brightnesses are of the same order of magnitude as the brightnesses of the materials observed in non-highlight directions. However, the only published standard method for gloss measurement available when the present war started was ASTM Tentative Method D523-39T for the Specular Gloss of Paint Finishes. For this reason it became standard practice to test camouflage materials for specular gloss according to this method.

2. *Geometry.* The geometry of a gloss measuring instrument is specified (1) by the directions of the centers of the incident beam and the reflected beam of light which is accepted for measurement and (2) by the amounts which light may spread from these central directions and still register in the receptor element.

About 1939, Dr. A. H. Pfund of Johns Hopkins University, who was at that time helping Subcommittee XVIII of Committee D-1 of the American Society for Testing Materials in its gloss research, found that measured values of specular gloss at 60° gave better correlation with visual estimates of the gloss of surfaces than did values at any other angle (unpublished results). Subsequently, Hunter and Judd [5] corroborated this finding. It has since been generally agreed that 60° is the best single angle at which to take measurements of specular gloss.

Hunter and Judd recommended that, in the rating of paint finishes for gloss, the central directions be 60° from the normal, and the spreads be:

	Source	*Receptor*
Spread in the plane of the centers of the incident and reflected beams	0.6 deg.	4.4 deg.
Spread perpendicular to the plane of the centers of the incident and reflected beams	3.7 deg.	11.7 deg.

These geometric conditions, which are those now given in Procedure of ASTM Tentative Method D523-41T, have been illustrated in Fig.

3. *Spectral characteristics.* Spectral characteristics are distinct secondary in importance to geometric characteristics in specificati for methods of measuring gloss. They should, nevertheless, be kno In ASTM D523-41T, the illuminant specified is ICI illuminant (similar to overcast sky) and the receptor is supposed to possess luminosity function of the ICI standard observer. However, depa ures from these conditions are permitted where it can be shown they will not materially alter the instrumental results.

4. *Standards.* Polished pieces of black glass have been mo widely used than other materials as standards of specular gloss. T scale of measurement generally used for specular gloss is that which the perfectly reflecting mirror is assigned the value 1000. silver mirror will reflect in the direction of mirror reflection abo 90% of the light incident on it. A polished piece of black glass w reflect at 60° about 9.5% of an incident beam. Shiny non-metal s faces of materials other than black glass usually have roughly the sa specular reflectance, while less shiny non-metal surfaces are cor spondingly lower.

When the perfect mirror is assigned the value 1000, the shine non-metal surfaces thus have values of specular gloss just less th 100. The unit in which these values are given was called the "p mil" in ASTM Tentative Method D523-39T but this name was dropp in preparing the 1941 version of the ASTM method because of t objection that it was confused with the similarly named unit of thic ness measurement. In ASTM D523-41T, it is called simply the u of specular gloss.

5. *Corrections for Diffuse Reflection.* It can be seen from Fi ure 1 that objects having low gloss reflect only a little more light the direction of specular reflection than in directions well remov therefrom. Thus it appears that a major part of the light reflected the direction of specular reflection by the average low gloss surfa is usually assumed to be diffusely reflected light.

Logic, therefore, suggests that, in converting instrument readin for light reflected in the direction of specular reflection to values specular gloss, corrections be made to account for light reflected di fusely. In practice, such corrections are frequently omitted for o or more of the following reasons: (1) Means for determining size corrections are lacking in some instruments used for gloss measu ment. (2) The sizes of corrections differ from sample to sample on when the samples differ in diffuse reflectance and thus samples of t same color can be properly ranked for specular gloss on the basis the uncorrected values. (3) The evaluation and application of su corrections takes time. Inasmuch as the practice of using uncorrect readings of specular gloss is well established, the above mention conference on the gloss measurement of camouflage materials reco mended that a procedure calling for the omission of corrections f diffuse reflection be given official recognition. It was suggested th such a procedure could be added as Procedure C to ASTM Tentati Method D523-41T.

Disparities in Specular Gloss Values Due to Differences in Instrument Geometry

Disparities in specular gloss readings from instruments using th same central angle result chiefly from the practice of using optical smooth working standards (usually pieces of polished black glass) i instruments which differ in the spreads of directions they treat a specular reflection. A piece of polished black glass reflects mirro images, whereas the typical low gloss surface spreads light wide about the direction of mirror reflection. The typical specular glos meter is built to accept the light reflected in the direction of mirro reflection plus that reflected in a restricted solid angle of directio surrounding the direction of mirror reflection. As this restricted sol angle varies from one instrument to another, the amount of lig accepted for measurement from the typical low gloss surface relativ to that accepted from the black glass standard must, therefore, vary

Thus, two specular glossmeters built with the same central direc tion of reflection, but with different spreads, will not yield the sam gloss value for a low gloss surface which is tested in each instrume against the same polished black glass standard. Each type of instru ment which has been widely used for the measurement of 60° specu lar gloss differs in spreads from all the others. These differences have been listed in Table 2 which gives the best available figures fo

TABLE II—Analysis of Methods and Instruments for 60° Specular Gloss Measurements

	Provision for diffuse correction	*Presence of vignetting*	*Spreads* source (degrees)	*Spreads* receptor (degrees)	*Solid angle of larger cone* (deg.)²	*Solid angle of larger cone* Relative to Proc. A cone
I. Published Methods						
ASTM D523-39T [1]	no	no	0.6 × 3.7	4.4 × 11.7	51	1.0
ASTM D523-41T (Proc. A) [2]	yes	no	0.6 × 3.7	4.4 × 11.7	51	1.0
Wright Field Method [7]	no	no	0.5 × 2.	0.5 × 2.	1.0	51.
ASTM D523-41T (Proc. B) [2]	yes	no	0.5 × 3.5	1.5 × 4.5	6.8	7.5
Proposed Procedure C of ASTM D523	no	no	0.6 × 3.7	4.4 × 11.7	51	1.0
II. Actual Instruments						
H. A. Gardner Laboratory 60° Glossmeter [8]	no	yes	2 × 10	4.4 × 11.7	51	1.0
Nat. Bur. Standards 60° Glossmeter (1942)	yes	no	0.7 × 3.5	4.4 × 11.7	51	1.0
Photovolt Glossmeter [6] 60° Search Unit, Type S	yes	yes	0.9 × 3.5	4.8 × 9.5	46	0.9
Aminco-Scott Goniophotometer [10]	yes	yes	0.2 × 0.8	4.5 × 11.5	52	1.0
		no	0.2 × 0.8	1.5 × 4.5	6.8	7.5
Multipurpose Reflectometer with 60° attachment [4]	yes	yes	4.5 × 4.0	12° diameter	113	.45

the source and receptor spreads of a number of these instruments. The table also indicates the presence or absence of a mechanism for obtaining corrections for diffuse reflection and the presence or absence of vignetting.

Vignetting takes place within a glossmeter when some of the light leaving the source within the cone of directions included in the source spread, or some of the light leaving the test specimen within the cone of directions included in the receptor spread, is blocked by diaphragms in the instrument. Because this light blocked by diaphragms fails to register as specularly reflected light, the readings from such an instrument differ from those of an instrument in which there is no vignetting. Whether the readings from the instrument in which there is vignetting are higher or lower than those of the non-vignetting instrument depends on whether relatively more of the light from the standard, or from the sample, is lost at the diaphragms. Even in instruments of identical manufacture, significant differences in vignetting are frequently caused by minor differences in the locations of lenses and diaphragms.

Use of Low Gloss Standards to Obtain Uniformity in Measurements of Low Specular Gloss

In general, low gloss objects spread reflected light quite uniformly through the fairly narrow ranges of directions of the reflection which is treated as specular reflection by different glossmeters. If suitable low gloss standards calibrated according to one accepted standard set of spread conditions can be substituted for the present mirror-like standards, substantial agreement between low gloss readings from instruments of different spreads can be achieved. If such standards are used, the different glossmeters will all compare the amounts of light reflected by the standards and by the unknowns within solid sectors of directions in which light will be similarly spread by the specimens involved.

Thus only two steps need to be taken to eliminate most of the disparities which now occur in measurements of camouflage materials for specular gloss:

(1) A standard geometry must be selected

(2) Low gloss standards accurately calibrated according to this geometry must be made available for use with all glossmeters not known to conform accurately to this standard geometry.

The National Bureau of Standards conference on the gloss measurement of camouflage materials took action with respect to both of these steps. They voted to recommend that the geometry of Procedure A of ASTM Tentative Method D523-41T be adopted as standard for the measurement of camouflage materials and they asked the National Bureau of Standards to obtain suitable materials, calibrate them and distribute them for use as standards of specular gloss.

At the time of the conference, five different instruments for measuring 60° specular gloss were present for exhibition and it was therefore possible to intercompare the readings which these instruments would give on a typical group of camouflage materials. Five plaques were chosen for this intercomparison. Since one of these, LG-4, had been previously measured for specular gloss according to the proposed new standard procedure, it was treated as the low gloss standard. The results of the comparison of the other four plaques with LG-4 are given in Table 3.

TABLE III.

Values of the 60° Specular Gloss of Four Panels Obtained by the Comparison of Each of Them with Panel LG-4 in Five Different Instruments. (Panel LG-4 was assigned the value 4.6 for 60° specular gloss according to Procedure A of ASTM Tentative Method D523-41T, except that no correction for diffuse reflection was made.)

60° Glossmeter	*Panel Designations* Glass 1-43	Glass JHB	Glass WRK	Paper LGW
NBS 1942 Glossmeter	1.5	3.1	9.0	25.
Photovolt Glossmeter	1.7	3.3	9.5	29.
Multipurpose Reflectometer	1.7	3.8	9.4	23.
Gardner Glossmeter*	2.	5.	10.	17.
Aminco-Scott Goniophotometer Proc. B	1.6	2.7	10.5	45.
Aminco-Scott Goniophotometer Proc. A (approx.)	1.5	3.2	10.7	32.

*Modified by enlarging receptor size (see text and reference [9]).

Panel LGW is in the intermediate range rather than in the low gloss range. The readings obtained for it illustrate the errors which occur when the sample and standard do not distribute reflected light in similar manners. The first three readings listed in Table 3 for this plaque are of about the same magnitude and therefore it can be surmised that these instruments possessed nearly the same effective receptor spreads. The receptor opening of the fourth instrument was purposely made larger than that listed for the corresponding instrument in Table 2 [9] in order to increase sensitivity. Because panel LGW is higher in gloss than the others, it tends to distribute light in roughly the manner represented by curve A, Figure 1. The low gloss standard, on the other hand, distributes light in roughly the manner represented by curve B. Thus, as the receptor is made wider, the increase in the total light reaching the receptor from panel LGW is relatively less than that from the standard. For the same reason, the

reading for panel LGW is relatively high on the fifth instrument with the narrow receptor.

Selection of Low Gloss Standards

The task of finding materials well suited for use as low gloss standards may prove difficult. In general, only objects with rough surfaces are low in gloss. Objects with rough surfaces possess one drawback as standards in that they can readily be damaged by contact with other objects. Dirt tends to deposit in the cavities of such surfaces and it can seldom be dislodged without altering the gloss. All low gloss objects which have been so far considered for use as standards will probably change in gloss from use. For this reason, it is planned to distribute low gloss standards in groups of several nearly identical plaques each. If this is done, it is felt that each plaque which changes in gloss from use will be promptly discarded and replaced with a fresh plaque which has not been altered by use.

Materials now being tried for use as low gloss standards include lacquered panels, painted panels, ground or etched glass plaques, pads of coated and uncoated paper, ceramic tiles, and pieces of resin-impregnated abrasive paper. Experience alone will indicate which of these materials are best suited for use as low gloss standards. To start the distribution of low gloss standards, the National Bureau of Standards is preparing panels of several types. An attempt will be made to have sets of standards* available with specular gloss values of about 2, 5, 10 and 20 on the proposed Procedure C scale. With time and the experience gained from the use of the first standards issued, it will be possible to determine which material or materials are most suitable.

*Sets of 82 low gloss panels each are now available from the National Bureau of Standards.—Ed.

Proposed Procedure C for Routine Measurement of Specular Gloss

By making a few additions and several minor changes in ASTM Tentative Method of Test for the Specular Gloss of Paint Finishes, ASTM Designation: D523-41T, the procedure recommended for use in the routine gloss measurement of camouflage finishes can be included in D523 as Procedure C. The changes which need to be made in the present tentative method are as follows:

In section (1) on *Scope*, change "two" in the first line to "three" and add the following paragraph:

> *Procedure C* may be used for the routine comparison of the gloss of surfaces of low and medium gloss where all surfaces in any group have approximately the same diffuse reflectance.

To the last sentence in paragraph (3) b on *Angles of Illumination and View*, add the clause:

> "except in instruments designed only for measurements according to Procedure C."

To section (4) on *Method of Measurement* add the following paragraph:

> (c) *Procedure C*—For measurements of specular gloss according to Procedure C, the 60° illuminating and —60° viewing conditions specified for Procedure A shall be used. Values of specular gloss according to Procedure C are therefore always higher than values for the same specimens according to Procedure A by the amounts of the diffuse corrections required by Procedure A.

To section (5) on *Specular Gloss Standards*, add the following paragraph:

> (c) When glossmeters are constructed which fail to comply with the spread specifications given above, the resulting instruments cannot accurately compare samples which are quite different in gloss. If, however, the samples being compared are similar in angular distribution of reflected light the failures of the instruments to comply with spread specifications do not cause serious errors in the results. To improve the accuracy of measurements of low gloss paint finishes with instruments which do not exactly meet the above spread specifications, the Natoinal Bureau of Standards issues low gloss working-standard panels calibrated according to Procedures A and C.

In the second line of paragraph (b) of Section 6 on *Preparation and Measurement of Samples*, change "procedure A" to "procedure A or C."

References

(1) American Society for Testing Materials Tentative Method D523-39T for Specular Gloss of Paint Finishes.

(2) American Society for Testing Materials Tentative Method D523-41T for Specular Gloss of Paint Finishes.

(3) R. S. Hunter, Methods of Determining Gloss, J. Research NBS 18, 19 (1937) RP958.

(4) R. S. Hunter, A Multipurpose Photoelectric Reflectometer, J. Research NBS 25, 581 (1940) RP1345.

(5) R. S. Hunter and D. B. Judd, Development of a Method of Classifying Paints According to Gloss, ASTM Bulletin 97, 11 (March 1939).

(6) Photovolt Corporation, (95 Madison Avenue, New York, N. Y.), Bulletin on the Photovolt Photoelectric Glossmeter, received May 1943.

(7) Harry Schecter, Air Corps Technical Report No. 4617 (RESTRICTED) entitled Development of Gloss Specification for Camouflage Finishes, March 27, 1941 (Materiel Center, Army Air Forces, Wright Field, Dayton, Ohio).

(8) Francis Scofield, A Portable 60° Glossmeter, Sci. Sec. Circ. 583 of the National Paint, Varnish and Lacquer Assn., Washington, D. C.

(9) Francis Scofield, The Measurement of Low Values of Specular Gloss, Sci. Sec. Circ. 659 of the National Paint, Varnish and Lacquer Assn., Washington, D. C. (May, 1943).

(10) L. A. Wetlaufer and W. E. Scott, The Measurement of Gloss, Ind. Eng. Chemistry (Anal. Ed.) 12, 647 (1940). See also Bulletin No. 2115 of the American Instrument Co. (Silver Spring, Md.) entitled Aminco-Scott Glossmeter (May, 1943).

Patents

Protective Lacquer

U. S. Pat. 2,344,708. E. A. Lasher, assignor to Flaxseed Products Co., Mar. 21, 1944. A protective coating composition comprising a lacquer-making cellulose derivative selected from the group consisting of cellulose esters and cellulose ethers and an acid ester comprising the product of the partial esterification of hydroxylated fatty oil with a hydroxy polybasic aliphatic carboxylic acid having from 3 to 7 carbon atoms, the acid number of said acid ester being about 230.

Wrinkle Lacquer

U. S. Pat. 2,347,303. W. A. Waldie, assignor to New Wrinkle, Inc., April 25, 1944. In the method of manufacturing wrinkle coating compositions, the step comprising adding to a wrinkle varnish base including a bottom drier and a top drier, a texture modifying agent comprising linseed oil fatty acids and a solvent therefor.

Wrinkle Lacquer

U. S. Pat. 2,347,304. W. A. Waldie, assignor to New Wrinkle, Inc., April 25, 1944. In the method of manufacturing wrinkle coating compositions, the step comprising adding to a wrinkle varnish base including a bottom drier and a top drier, a texture modifying agent comprising a mixture of fatty acids of linseed oil and China-wood oil and a solvent therefor.

Spray Recovery Means

U. S. Pat. 2,347,728. C. C. Bell, assignor to United Shoe Machinery Corp., May 2, 1944. In a spray booth, a stacked series of parallel closely spaced baffle plates, the top plate having a centrally disposed rectangular opening of relatively large area therein, and a panel arranged to occupy said opening, said panel being hinged to the plate, whereby the panel may be tilted back to expose the second plate, said panel having an aperture therein.

Varnish Composition

U. S. Pat. 2,347,923. F. G. Oswald, assignor to Hercules Powder Co., May 2, 1944. A coating composition comprising a bodied and reacted mixture of a resinous ester of a member of the group consisting of pentaerythritol and mixtures of pentaerythritol and polypentaerythritols with a rosin acid and an amount of maleic acid which is above about 1% but no more than about 9% of the weight of the rosin acid, said acids being substantially completely esterified, and linseed oil.

Coating Composition

U. S. Pat. 2,348,447. E. Bock (Germany), vested in the Alien Property Custo-

dian, May 9, 1944. As a new composition of matter a solution of 20 parts of highly polymeric vinyl isobutyl ether in 40 parts of benzine and 40 parts of acetone.

Paint Spray Recovery

U. S. Pat. 2,348,625. H. E. Hoffman, May 9, 1944. A method for the recovery of excess sprayed enamel paint material which comprises subjecting the excess sprayed enamel paint material to treatment with water to form a sludge containing pigment and the associated vehicle, heating the said sludge until it is softened sufficiently to readily flow, mixing the heated sludge with "Varnolene," stirring the said mixture sufficiently to form a relatively homogeneous mass containing only a small proportion of undesired, undistributed solid masses and separating the said undesired masses from the admixture.

Spray Gun

U. S. Pat. 2,348,568. R. R. Pellar, May 9, 1944. A spray gun comprising a body and head of unusual design.

Articulated Paintbrush

U. S. Pat. 2,348,972. W. K. Gray, May 16, 1944. An articulated paint brush comprising an elongated handle having a bore therethrough, a ferrule mounted on said handle, a brush receptacle including side walls and a bottom, means to pivotally mount the brush receptacle on the ferrule, a brush retaining collar removably seated in the brush receptacle, bristle members in said collar, said receptacle having a hole in the bottom thereof and aligned with said handle bore, an eye member having a shank passing through said hole and having a head thereon secured upon the inner face of the said receptacle bottom, an operating member slidable within said bore, said operating member having an end portion thereon engaging said eye member, and means to hold said operating member in adjusted position.

Apparatus for Coating Containers

U. S. Pat. 2,349,455. E. P. Olson, assignor to The Diamond Match Co., May 23, 1944. The combination with a receptacle for coating material, and means for supporting an opentop box adjacent thereto, of a depending brush, means for supporting said brush and alternately positioning it over said receptacle and an adjacent box on said supporting means, and means for independently reciprocating said brush at the limit of each positioning movement thereof, thereby dipping the brush into the contents of the receptacle and transferring the charge to and painting the interior surface of said box.

Testing Paint Films

U. S. Pat. 2,349,699. L. Boor, assignor to American Cyanamid Co., May 23, 1944. The method of measuring the drying and hardening properties of a paint film which comprises coating a disc with a paint film, rotating the disc in contact with a weighted, inked ball whereby an imprint of the ball is made on the paint film, measuring the width of the imprint and determining the hardness of the film therefrom.

Business Items

Jean Wynkoop

Miss Jean Wynkoop recently was appointed to the Los Angeles Organic Research Staff of *Turco Products, Inc.*, of Los Angeles, Chicago and Houston, according to *S. G. Thornbury*, President and Technical Director.

Miss Wynkoop recently received her M.A. degree from the University of Southern California for her work on industrial water softeners. While completing her studies, Miss Wynkoop devoted part of her time to laboratory work in the Turco plant and thus is thoroughly acquainted with the synthesis of industrial chemical compounds.

Previously, Miss Wynkoop took her A.B. degree at Whittier College, was Assistant Research Librarian at Union Oil Company in Wilmington, Calif., and an instructor in mathematics at Marlborough School for Girls.

Milton T. Vreeland has been named general manager of the *Voltax Co., Inc.*, Bridgeport, Conn., it has been announced. Previously he was industrial representative with the Hilo Varnish Corp. and the Glidden Co. in the Connecticut and western Massachusetts territories.

Announcement has been made by *Jones-Dabney Co.*, Louisville, Ky., of the appointment of *George A. Litchfield* to the posts of vice-president and director of sales. Mr. Litchfield has been with the company since 1934 and previous to his appointment was Eastern divisional sales manager.

The *Agricultural and Mechanical College of Texas* is planning a surface protection course under the supervision of *Dr. J. D. Lindsay*, head of the Chemical Engineering Dept. and taught by *M. V. Jones*, chief chemist of the Kuhn Paint and Varnish Works, Houston, Texas.

The course as now outlined will cover subjects including coating types, raw materials, manufacture, surface preparation, application, storage, safety measures and testing.

Laurent J. LaBrie

Mr. Joseph Morningstar, President of *Paisley Products, Inc.*, has announced the appointment of *Laurent J. LaBrie* as Technical Director of their Chicago and New York City plants.

Mr. LaBrie was formerly Chief of Heavy Chemicals Unit, Office of Price Administration, serving from 1942 to 1944. Prior to his Washington position, he served as Technical Director of J. A. Tumbler Laboratories, Baltimore, Md., and Vice President of their Canadian Subsidiary. From 1927 to 1934, he served as Chief Chemist and Superintendent of Farboil Paint Company, Baltimore, Md.

A graduate Chemical Engineer, receiving his B.S. at the University of Pennsylvania, he brings to his new responsibilities a broad and active experience in industrial chemical product development.

Wells Martin, former deputy chief, will succeed *Thomas J. Craig* as chief of the *Protective Coatings Branch* of the *Chemicals Bureau*, according to an announcement by the W.P.B. Mr. Martin will also serve as chief of the Natural Resins and Naval Stores Section.

Benjamin H. Belcher will succeed Mr. Martin as deputy chief and will continue as chief of the Coatings Section.

"I KNOW THE GOVERNMENT WANTS TO SAVE GAS, BUT WE CAN STILL HAVE JUST AS MANY BATHS WITH LESS HOT WATER!"

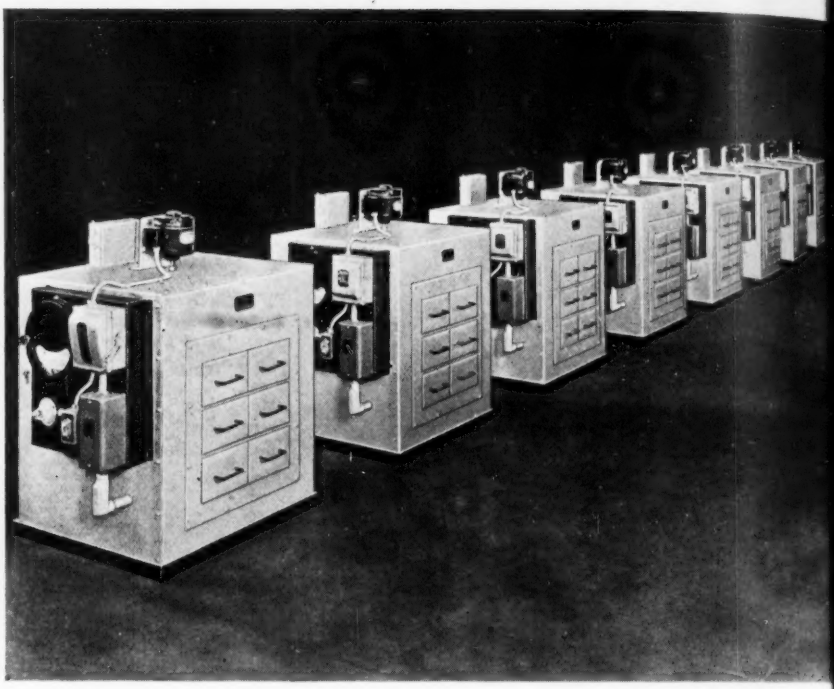
NEW EQUIPMENT AND SUPPLIES

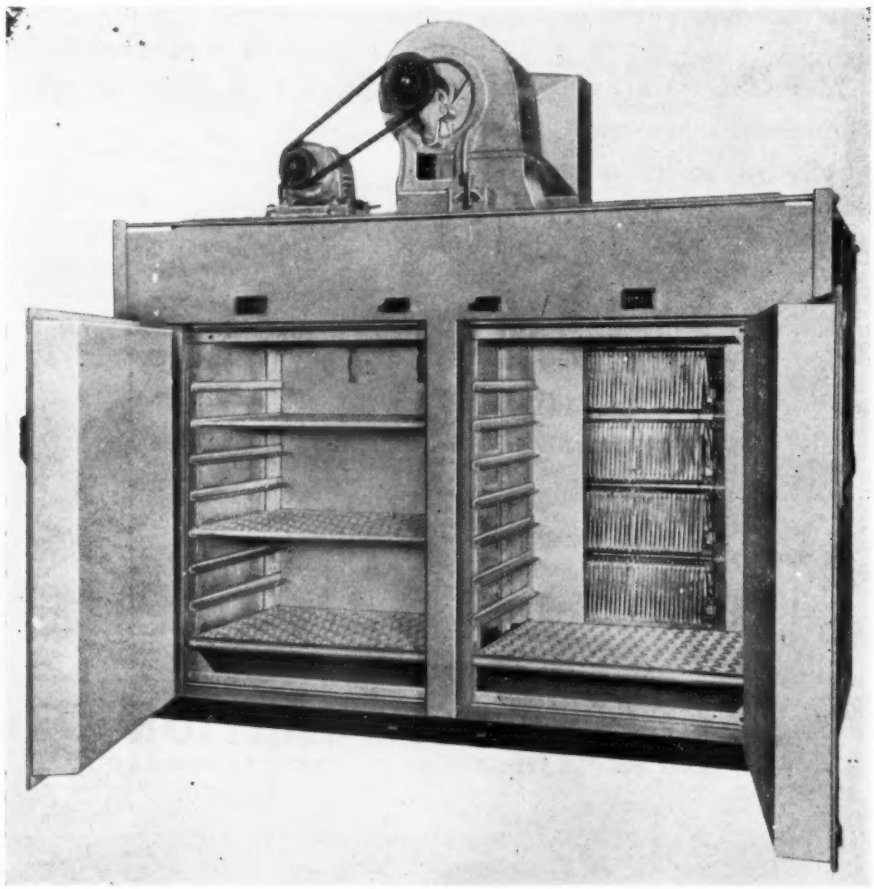
Drawer Type Ovens

Originally designed for preheating bakelite prior to forming operations, the ovens illustrated may be used for baking finishes on small items. With the exception of the front panels containing the drawers the ovens were assembled from standard units. The drawer panels are the same overall size as regulation doors and, therefore, if the nature of the work should change in the future, the ovens can be converted into the usual shelf type by merely substituting standard doors for front panels and putting in the shelves, supports for which are already in place.

In the ovens pictured, heated air is circulated on the down-draft principle, applicable when the work consists of quantities of small parts. As a further aid to free circulation and elimination of heat losses, drawers are constructed of expanded metal and close against asbestos gaskets. Temperatures up to 500°F. are under fully automatic control and the ovens may be connected to exhaust piping if necessary.

Full information may be obtained from the manufacturer, Koch Industrial Equipment, Inc., Dept. OF, Evansville, Ind.





Roller Hearth Furnace

A new down flow recirculating type electric oven has been developed which presents the combined advantages of forced convection heating and rapid recirculation. This method of heat distribution is particularly desirable for objects which are hollow and open at the top or can be arranged on trays or suspended from cross bars in such a manner as to permit the heated air to sweep down over the work so as to expose each piece to the same heating conditions throughout the oven. Designed originally to preheat hollow magnesium castings, it is also applicable to process drying, finish baking and heat treating operations at any temperature to 1000°F.

The oven shown at left is a two-compartment unit designed and built by Gehnrich Oven Division of W. S. Rockwell Company, Dept. OF, New York, N. Y., but can be built as single or multiple compartment units of any desired size. Its construction embodies patented staggered joint, insulated dual panel assembly throughout, which eliminates through-metal conduction and minimizes heat loss through walls, roof, floor and doors. Heating is provided by means of electric heaters mounted at the rear wall of each compartment but separated from the heating chamber by an easily removable, insulated panel. A motor driven fan mounted at the top of the oven blows the heated air through a distribution duct at the top of the oven interior, with the air moving down through the work, passing through the floor, back through the heater space and up to the fan intake.

PEROLINE and DEOXIDINE

. . . *Eliminate Rust Bottlenecks* . . .

Humid, rainy summer months are rust months and play havoc with metal production. Vital supplies of war materials are delayed—at times stopped.

Rust bottlenecks no longer need occur to hamper production. Peroline and Deoxidine will eradicate and prevent rust, making these stoppages or delays unnecessary either in rainy seasons or at other times.

Peroline (a combined chemical and oil) not only effectively retards corrosion on steel components in processing, in storage and in transit, but—it dissolves blushes of rust, eliminating the labor of a separate cleaning operation. There is a grade of Peroline for application to wet surfaces as well as grades for application to dry metal. Peroline is unique in its ability to clean and, when the oil phase is removed with degreasing solvents, to leave the surface properly conditioned for painting.

Surface Badly Rusted. If in processing, surfaces have become badly rusted, Deoxidine provides a fast and easy means for removing and eradicating rust and rust stimulators, leaving a surface properly prepared for painting.

If you are experiencing rust troubles, the ACP technical department will gladly consult with you and recommend the method best suited to correct and prevent future rust annoyance.

Write for Technical Service Data Sheets.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

Note: West Coast Plants may address inquiries and orders for prompt delivery to: Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

CHEMICALS ACP PROCESSES

American Chemical Paint Company, Ambler, Pa.
Please send me general Technical Service Data Sheets on
☐ Peroline ☐ Deoxidine

*Name*_____ *Title*_____

*Company*_____

*Address*_____

C-7

Glossmeter

Scientific Laboratory, Dept. OF, 4 Elm St., Bethesda, Md., has announced new high sensitivity glossmeter which g reading corresponding to Procedure A A.S.T.M. D523-41T without the gloss rection (Procedure C of the new spe cation). This instrument, which repla the 60° glossmeter now out of product because of unavailability of certain terials, is said to be rigidly constru and does not get out of adjustment eas By turning a switch it may be used accurate reading of low gloss.

Wet Abrasion Apparatus

A wet abrasion apparatus for testing washability of organic finishes under trolled conditions may be obtained f Henry A. Gardner Laboratory, Inc., D OF, 4723 Elm St., Bethesda, Md.

This device consists of a vacuum-o ated windshield wiper having a speed trol. An ordinary water aspirator will p vide sufficient vacuum to operate the wi The wiper arm is connected to a spe brush which has been weighted. The br and weights equal one pound. The wi is firmly attached to a one quarter i table upon which the test panels are pla for determining washability. The num of brush strokes is recorded by an a matic counter attached to the wiper or by a hand counter.

In operation, the test panel is pla on the table and the surface is wet water or a detergent solution. The br is placed in operation by attaching to aspirator. The brush is allowed to rem in motion until the painted surface abraded through or a soiled area is clea

Further information and prices may obtained on request to Henry A. Gard Laboratory, Inc.

Double Cylinder Rotary Air Pu

A two-cylinder air pump combining advantages of two separate single cyli pumps while retaining the compact cons tion of the single pump has been announ by Leiman Bros., Inc., Dept. OF, New N. J.

This pump is of the rotary type and is for air pressures up to about 50 lbs square inch and for vacuum up to about inches mercury. One cylinder may be for pressure and the other for vacuum both may be used for pressure or for vacu One cylinder may pump into the other the purpose of increasing the air pres or one may pump from the other to incre the vacuum as occasion may require.

The machines are said to be remark smooth in operation, cool, quiet running very efficient in comparison with the method utilizing separate single cyli pumps.

Made in several sizes, manufacturers quiring air pressure or vacuum or both find the answer to many of their problem this latest production in the line of ro made by the company. Information wi furnished on request to the company.

Sealing Compound for Castings

Ault & Wiborg, Division of Interchemical Corporation, Dept. OF, 1754 Dana Ave., Cincinnati, Ohio, have designed a synthetic resin specifically for use with monomeric styrene in sealing porous castings. This new resin is a 100% nonvolatile compound, having a viscosity of Y-Z on the Gardner-Holdt scale (18-23 poises). It is designated as No. 988 Magnesium Sealing Compound — Styrene Soluble.

According to the company the usual mixing proportion is equal parts resin and styrene, though this depends somewhat on the porosity of the casting. An equal parts mixture gives a viscosity of approximately 5 centipoises. If the casting capillary openings are small, more styrene is used in the mixture — about 40 parts resin to 60 parts styrene. If they are large, the viscosity is increased by using a mixture of 60 parts resin to 40 parts styrene.

It is claimed this new resin has the property of cross-linking with the styrene molecule during polymerization without the aid of any catalyst. In fact, the impregnating solution is simply prepared by mixing the desired proportion of resin and stabilized monomeric styrene. Because of the cross-linkage between the two molecules, the co-polymer is gasoline insoluble.

The recommended impregnating procedure for sealing porous castings is the usual vacuum-pressure method where the vacuum removes the air from the casting and the compound is forced in under pressure. Variations, though, may be made in this technique to meet certain specialized conditions. After the casting has been impregnated, it is baked 2 hours at 250°F. to 275 F. to polymerize the sealing compound. It is desirable to bake the casting under pressure.

Because there are no volatile solvents to escape when baked under pressure, the sealing is said to be very efficient and it is rare that the castings have to be "resealed" a second time to completely seal. It is claimed that the usual industrial cleaners work satisfactorily to remove the synthetic resin-styrene solution from the outside of the castings, after impregnating and before baking the sealing compound.

Non-Alkyd Crinkle

As a replacement for synthetic alkyd crinkle finishes, the phthalic anhydride for which is being allocated by the W.P.B. to produce insect repellent, The Forbes Varnish Co., Dept. OF 3800 W. 143rd St., Cleveland 11, Ohio, has developed a line of non-alkyd crinkles.

According to the manufacturer these crinkles are low viscosity, easy spraying materials which bake hard and tough in 30 minutes at 300°F. or on an equivalent schedule. They are available in medium-fine texture with medium sheen.

Respirator

American Optical Company, Dept. OF, Southbridge, Mass., announces that its R-1000 respirator, developed to protect workers against certain dusts, fume and gas hazards, is now being equipped with knitted cotton facelets.

These facelets make any respirator more comfortable to wear because they are soft against the skin, absorb perspiration, and give the face a certain measure of protection against dust and dirt.

The facelets help to prevent skin irritation and do away with the necessity for protective creams to avoid face chapping. Designed to make any industrial operation more comfortable, the facelets are particularly valuable where workmen handle such products as cement, lime and gypsum, or perform operations like paint spraying.

The new AO facelets can be ordered separately. Packed 50 in a box, they can be washed and used over and over again. They will fit most standard design respirators.

New Infra-Red Lamp

A new 375 watt reflector type infra-red heat lamp has been added to the Birdseye line, the Wabash Appliance Corporation announces. The new lamp is made in clear and ruby glass.

This higher-wattage Birdseye RE-40 is designed to produce higher drying temperatures not possible with available 250 watt sizes. With the addition of the 375 watt lamp, the Birdseye RE-40 reflector type infra-red heat lamp is now obtainable in 125, 250 and 375 watt sizes for flexible control of temperatures.

Heat-proof Superlok base, more efficient and durable ceramic heat reflector disc, the famed Wabash tungsten "M-Filament," and built-in reflector are standard features of the new 375 watt Birdseye infra-red lamp.

Write Wabash Appliance Corporation, Dept. OF, 335 Carroll Street, Brooklyn 31, N. Y. for further information.

Manufacturers' Literature

Clorafin Plasticizer and Resin

A new technical booklet describing the properties of Clorafin 42, plasticizer, and Clorafin 70, resin, used in the production of fireproof, waterproof and weatherproof coatings for fabrics, has been issued by *Hercules Powder Company*, Dept. OF, Wilmington, Del.

Clorafin 42, a light amber colored, viscous, non-flammable plasticizer, is emulsified very easily. Recent tests show Clorafin 42 to be a good plasticizer for some of the vinyl resins.

Clorafin 70 is a pale straw colored, hard, brittle resin with interesting flame extinguishing characteristics. Present uses, in addition to the formulation of flameproof coatings and waterproof coatings, include the formulation of flameproof paints and flameproof adhesives.

It is believed that Clorafin 70 will be useful in many applications where flameproofing qualities, hardness and stability are important because of its very good stability and compatability with plasticizers and other resins.

At the present time both Clorafin 42 and 70 are available to companies with a priority rating.

"Infra-Red" Gas Burner Catalog

A new 114 page catalog, rich in illustrations and descriptions of Burdett "Infra-Red" Principle Gas Burners and Combustion Equipment, also presenting engineering and reference material, has just been released by the *Burdett Mfg. Co.*, Dept. O.F., 19 North Loomis St., Chicago 7, Ill.

This new catalog, due to its extensive and detailed presentation of valuable information, will be sent only to Distributors and Industrial Sales Engineers upon request to the company and written on their company stationery.

It includes Burners, Mixing Equipment, Valves, Gas Pressure Regulators, Motors and Blowers, Pilot Safety Devices, Temperature Controls, Electrical Accessories and General Engineering Data such as Velocity Pressures, Motor Ratings, Measurement of Electrical Power, Calculating Power Requirement Tables and Charts, Heat Losses, Thermal Capacity of Gases, etc.

ABC of Luminescence

The *New Jersey Zinc Company*, Dept. OF, 160 Front St., New York 7, N. Y., has recently issued a 24-page booklet titled *The ABC of Luminescence*. The booklet gives a clear picture of luminescence by discussing in simple language the characteristics, properties, limitations and applications of inorganic luminescent pigments. A number of excellent charts, diagrams and tables are included to illustrate the text and four pages of definitions of terms are given.

Copies of the booklet may be obtained from the company at the above address.

Lubrication

How centralized lubrication systems increase the production output of machinery and at the same time make impressive savings in time, power and lubricating materials, is the theme of *Bulletin No. 25*, newly published by *The Farval Corporation*, Dept. OF, Cleveland, Ohio. This 16-page booklet, printed in three colors, is a graphic portrayal of the theory and practice of mechanical lubrication. It opens with a study of the machinery lubrication problem and of the economies that are inherent in a system which delivers lubricant to all bearings in exact measured amounts regardless of location. This information is faced by a large close-up of a Farval Manual Dualine System at work. There follows an explanation, by means of six cutaway drawings in color, of how the Farval measuring valve operates to deliver a measured amount of lubricant, and why it can do this without recourse to springs, check valves or small parts. The construction and operation of both manual and automatic pumping units, which provide the high pressure source of lubricant supply, are similarly treated. The center spread is devoted to the economics of positive mechanical lubrication; and in the concluding pages a selection of 24 application photographs suggest methods of locating and mounting pumping units and feed lines on as many different kinds of machinery.

« « INDEX TO ADVERTISERS » »

« « ODDS and ENDS » »

Communications Dep't:

We have often taken great delight in pointing out boners appearing in the advertising pages of other magazines. Last month three of our subscribers gleefully brought to our attention the mention of *non-electrolytic* anodizing in an ad appearing in a recent issue of *Metal Finishing*. We KNOW there is no such animal, but the last time we tried to convince an advertiser that *emersion* in a solution was not correct, since emersion means *to withdraw from*, we received only hurt looks. Besides, who are we to argue with a good advertiser??

Joe Haas (National Silver Co.) was the fourth to call up about the expert(?) in the New York district office of the War Production Board who is telling all chromium platers, applying for chromic acid allotments, to use sodium dichromate instead, since the latter is more readily available. *We suggest that the next applicant ask for the solution formula and a guarantee!* Nothing surprises us any more, since the O.P.A. out our way ruled that a 50 per cent cut in transportation services could not be considered a *substantial* reduction! So help us, that was the word they used—we have it in writing!!

It Never Fails:

Why is it that after the inspection department constructs a set of tables for a variety of *Average Outgoing Quality Limit* values and *Process Average* classes, after periodic sampling of finished parts is employed to insure impartial cross-section of the lots, and after all possible precautions have been taken to eliminate defective plating, the government inspector will *always* grab hold of the one part which did not have a good contact in the plating tank and will test it for thickness of deposit?

Times Have Changed:

Glancing over the *Situations Wanted* pages of our daily paper we were struck by the fact that so many people are requesting jobs with a future. Back in the days when we used to read the *Help Wanted* columns regularly, every job offered promised a future, although we will admit that the *kind* of future was rarely, if ever, specified.

No one can fail to be impressed by the effect of aviation on equipment design, especially electrical. Imagine a 10 HP motor weighing only 15 lbs. and a 400 ampere-30 volt generator tipping the scales at 67 lbs.!!

Manganese was once called *magnesium*. And magnesium was also once called *magnium* by Sir Humphrey Davy.

The *English Factory Act* of 1844 prohibited the employment of children *under eight years of age* in the mills.

C. H. Aneshanley (National Cash Register Co.), describing an interesting procedure for testing the continuity of thin or flash chromium plate over flat steel parts, states that *the plate may be only* 0.0005″ *to* 0.00075″ *thick*. We can remember back in the pre-war days when a flash chromium plate was 0.000001″ *thick—or less*. How times have changed!!

Miscellanea:

We liked *Gracie Allen's* suggestion that all enlisted men be furnished with metal oak leaves and eagles for costume jewelry. Anything to help the metal finishers!

The recent death of *Dr. Leo Baekeland*, inventor of Bakelite, reminded us that *Dr. H. T. Kalmus*, known in our industry for the development of the cobalt plating solution, was responsible also for Technicolor movies.

From the New York Times: "Tantalum is a blue-gray metal *three times heavier than lead*." Says who??

Slogan of the Month:

The Doughboys Need the Dough Boys—Buy War Bonds.